VOLUME 8
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VISION ▸ AUTOMATION ▸ CONTROL

INSPECT

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Complies with the IIDC v1.31 standard to work seamlessly with third-party imaging software and drivers.

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Configuration flexibility eases integration — standard or mini 1394 connector; C/CS-mount or micro lens holder; and optional case.

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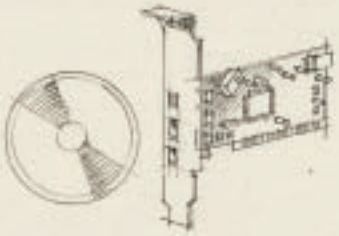

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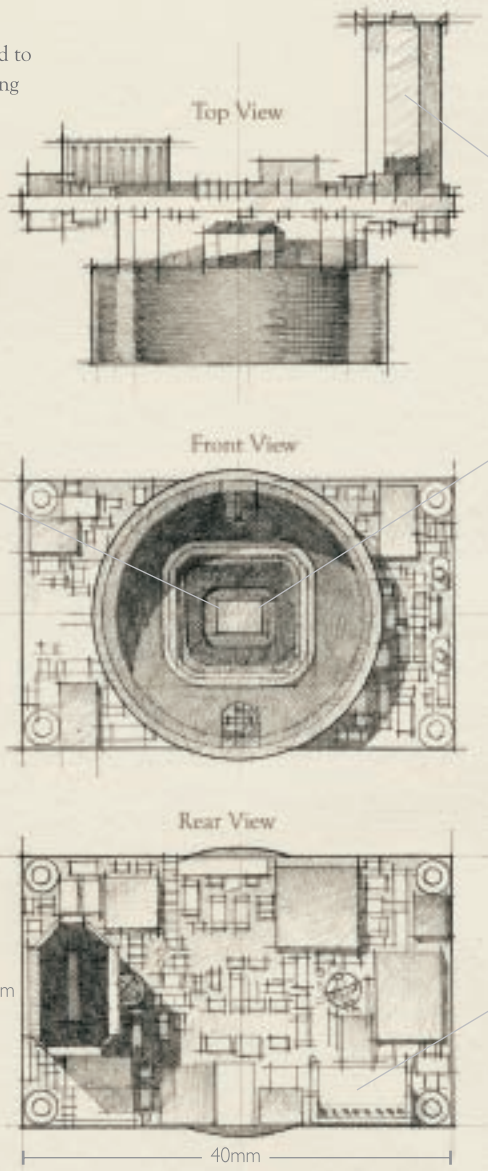
This full-featured IEEE-1394 board level camera packs a wide-VGA 60 FPS punch into its tiny 25x40mm frame, and sips less than 1W of power.



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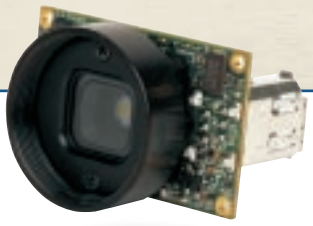

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Point Grey Research® Inc. is a worldwide leader in the development of advanced digital camera systems. Point Grey designs, manufactures and distributes IEEE-1394 cameras, stereo vision cameras and spherical digital video cameras, directly and through a network of distributors, to a broad spectrum of industries.

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POINT GREY RESEARCH

10 Years of Innovation in Imaging

Second Life:
Future First Place of Business?

Just imagine the possibilities: doing business globally without having to travel at all. No more wasting of hours getting to your destination, no more "you are selected for special screening" harassment on US airports, no more bad air, bad food and cramped legs with 14 hours hops to Asia, no more traffic jams, no more missed connections, …. Instead only warm and comfy sitting in front of your notebook, a cup of coffee next to you and the worlds biggest market place just one keystroke away.

Today you can already virtually test-drive your new Beemer or buy a pair of sport shoes (virtual and real) in Second Life [1]. Maybe tomorrow you will be able to visit a trade show there. The products will be shown in 3D animation, including all the technical specs and the pricing that applies to your company. The salesperson has enough time for all your questions and enough expertise to answer them as well. There is no need to walk endless halls to get to the couple of vendors you want to see, there is also no need for stale coffee and standardized trade show cookies to get you through the day. In minimal time you are perfectly informed about the new products of your vendors, about some interesting new players on the market and you chatted amicably with your favourite suppliers as well as with a couple of business partners also visiting the show. – That is your avatar chatted with their avatar, which is even better since you did not shave this morning.

Nice scenario, very effective, very cost saving for your company, might be even healthy for yourself, compared.

For the vendor: even better. Just imagine being able to be present at virtually all interesting trade shows worldwide, without the hassle of shipping material and people all over the world, building costly booths and getting your equipment running without electricity in – say – Mumbai. Your products are represented always in the new version, information updated immediately, your sales force reaches spectacular peaks of efficiency and after you had issued the company-wide rules of conduct for your employees in the Internet, your CI is transported flawlessly.

It is remarkable anyway how much, in general, the avatar today resembles the actual person as opposed to being some sort of fantasy superhuman. Admittedly, there might be a tad fuller hair or a wee bit less tummy, but all in all there is a tendency to design the electronic image as a match for the physical appearance of its owner. This shows that the virtual reality is on a clear path to being used as a means of transportation more than as a fantasy game place. Still short of "Beam me up, Scotty", there is no faster way to travel than the Internet. Maybe Second Life in its form today is not yet the pinnacle of an electronic market place ready for capital goods, but the need is clearly there. This is also very visible with the increasing popularity of Internet business networks (did you know that there is an Imaging & Machine Vision group at Xing?).

So are we already on the verge of a new way to do business or is the physical personal contact irreplaceable in the foreseeable future?

As always, I am looking forward to your feedback.

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[1] http://en.wikipedia.org/wiki/Second_Life

NEWS

COVER STORY

In recent years, microscopy has been undergoing a renaissance, driven by the significant role played by optical microscopy in industrial applications, as well as issues concerning ergonomic aspects of the instrumentation. It is important that the capabilities of research and inspection equipment must keep pace, but there are also a number of clear optical and non-optical requirements that must be met.

VISION 25

Due to strict product quality and safety requirements, quality control in pharmaceutical applications is an exceedingly demanding process. Therefore, computer-based quality checks are the only option for thorough, cost-effective and sensible product control. Intelligent cameras provide the computing power of a modern PC and execute all image processing routines.

New Aerospace Competence Center

The recent growth in orders coupled with the company's focus towards the dynamic test sector has enabled the Zwick Roell Group to identify many opportunities for its customers in the aerospace industry as they transform their businesses and respond to the latest challenges. The Group is pleased to announce that it has recently appointed Mr. David Phillips to co-ordinate all global activities relating to its presence in the aerospace industry. David joined the Zwick organisation in 1982 fulfilling a number of important roles in the UK and, more recently, as Managing Director of its Asia-Pacific Headquarters. In his new role as Vice President, Corporate Marketing, he brings both a technical and commercial understanding of the needs of customers and is collaborating with many leading aerospace organisations.

www.zwick.de

Videor Technical Launches ADP Programme

The German distributor for the new open source camera system from Festo is breaking new ground: With an ADP (Additional Development Partner) programme, Videor Technical is addressing system integrators who have demonstrated solution competence in industrial image processing (IIP) projects for industry-specific and task-specific problems and wish to open up a wider circle of customers through software developments for the open source camera. The intelligent camera system is sold by Videor Technical under its own eneo SC brand. Working on Linux, the eneo SC offers maximum application-specific computing power. IIP applications are to be developed and brought onto the market in the course of the ADP programme.

www.videortechnical.com

Expanding Central European Representation

Rubroeder Factory Automation promoted Guenter Busch (53) to regional sales manager for the areas Austria, Switzerland and South Germany. Busch brings many years of electronics industry experience to the position, which he acquired with Universal Instruments, Panasonic Factory Solutions, the Max Planck Institute and Heraeus Instruments, among others. There, he was occupied with sales and consulting assignments as well as in development engineering. "Many of our clients are based in this region, which necessitated an expansion of part of our sales department," says Dipl.-Ing. Wolfgang Riedel, general manager of Rubroeder. „In order to be able to maintain our fast reactivity and customer proximity in this region, we established the Munich bureau with Mr. Busch as contact person."

www.rubroeder.de

Viscom Applications Center in China

On February 12, after having been granted its business license by the Chinese public authorities, the new applications center in Shanghai could assume operations. The official opening celebration with guests did take place May 9 in the presence of the Lower Saxony Premier Christian Wulff. Thus, Viscom systems may now be extensively tested on-site. Also, training is now offered, in Chinese and English languages. Within the spacious 360 m² room, directly in the heart of Shanghai (Puxi), all the inspection systems will be available to the customer for thorough testing and benchmarks of their performance capabilities and quality. Due to longer transportation and installation times in Asia, previously Viscom could only offer to conduct one test per month. Now, test frequency can be boosted up to four benchmarks per week.

www.viscom.de

Workshop Application of Optical Measurement Techniques

The one-day seminar on October 19 gives an overview of the applications of optical measurement techniques. The needs of mechanical engineering are discussed and actual fields of application are pointed out. Lectures will be given - amongst others - by speakers from the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen and the Institute of Production Science (IPK) of the University of Karlsruhe. Moreover, leading companys will present their measuring software (Leica, Zeiss). Hands-on-demonstrations will offer the participants the opportunity of testing optical measurement techniques themselves.

www.gik.uni-karlsruhe.de/messtechnik2007.html

Successful Year for Stemmer Imaging

The Stemmer Imaging Group was able to finish another very successful year: The 2006/07 financial year ended on June 30th, 2007 with overall sales of € 40.2 million. This result means the Group was again able to grow by app. 10 percent. With its actual revenue, the Group still is by far the largest source for machine vision components and services in Europe and has continued its booming development since it was first introduced in 2004. During the last financial year, growth rates above the average have been realized by the product group of cameras, which still is the main pillar of the Stemmer Imaging sales. The product segments optics, illuminations and the software business including the Common Vision Blox machine vision library have also been very successful.

www.stemmer-imaging-group.com

German Machine Vision Technology Globally Successful

The German machine vision industry continued its growth path in 2006 and increased its aggregated sales volume by 9 % reaching € 1.1 billion in total. This result confirms last year's forecast. „Notably the domestic market developed favourably. Our sector expanded sales in Germany by 11 %",said Dr. Olaf Munkelt, Member of the Board of VDMA Machine Vision and Managing Director of MVTec Software, Munich. For 2007 the companies surveyed by the VDMA estimate a further increase of 6 % in the sector's total sales volume. Machine vision technology made in Germany continues to be globally successful: A few years ago, the export share stood at around 40 %. In contrast, by 2006 approximately 57 % of sales were achieved abroad.

www.vdma.org/vision

Panasonic Sets up European Systems Organisation

Effective 1st, April 2007 Panasonic System Solutions (PSS) embarked on a new European structure under the title PSSEU. Encompassing a wide product portfolio including security, digital signage and media and industrial cameras, the new European company will build on its local successes and strengths by establishing its operation to meet the new demands of an increasing EU customer base. The changes see former UK Systems Manager Simon Wright promoted to PSSEU Managing Director, giving him responsibility for operations at a European level. Responsible for the EU sales team is Panasonic's Head of Medical & Industrial Vision, Jens Wohlerdt, located in Hamburg/Germany, who will manage the new team consisting of Sales, Marketing & Technical Support.

www.panasonic.co.uk/psseu

Key to markets Messe Stuttgart

Find the difference!

VISION 2007

20th International Trade Fair for Machine Vision and Identification Technologies

Neue Messe Stuttgart
6 to 8 November 2007

Key experience.

Process optimisation need not be expensive. You can find out for yourself at the world's leading trade fair for machine vision. Thanks to the latest developments, the systems and components are becoming increasingly powerful. The good thing: they are therefore also becoming less expensive. So the low investments pay off after just a few months. Discover your individual machine vision solution at VISION 2007, at Europe's most modern trade fair centre.

www.vision-messe.de

There and back in 1 day!
5 minutes on foot from Germany's second-biggest destination for budget airlines at the new Stuttgart Trade Fair Centre.

New Managing Director at Baumer Optronic

Baumer Optronic in Radeberg – a member of the worldwide Baumer Group – is a leading manufacturer of digital image acquisition components and smart vision sensors. On 1 September 2007 Dirk Rüttgerodt will become the Managing Director for commercial management at Baumer Optronic and will work closely with the long-time Managing Director for technical management, Dr. Joachim Ihlefeld. The most recent commercial manager, Dr. Oliver Vietze, has been appointed to the management board of the Baumer Group. *www.baumeroptronic.de*

Northwire Opens European Office

Northwire has opened a European office in the Netherlands, meeting a largely unmet need for made-to-order cable among European customers. The Company offers a complete line of rugged made-to-order fieldbus cable for industrial networks under the DataCELL FIELD brand specifically developed for the needs of European customers – including Profibus PA (process automation), Profibus DP (discrete process), Fieldbus Foundation H1 and AS-interface Cable. It also offers Retractile Cords, DataCELL GEV-1000 Gigabite Ethernet Cable for machine vision and other industrial applications and DataCELL MVC-800 FireWire B Machine Vision Cable in standard and extended-distance lengths. *www.northwire.eu*

Framos and Micron cooperate

Framos and Micron have been cooperating in the field of image sensors for only two years. Now Micron complimented Framos on the "Most Imaging Design Registrations For Central Europe 2006". With this award, the manufacturer of CMOS image sensors pays tribute to the unrivaled number of "design-ins," i.e. the many applications with integrated Micron CMOS sensors customers have implemented. This success proves that the mission as a solutions provider of image processing components is bearing fruit. Unlike other major distributors, Framos strives to develop optimally customised solutions in close collaboration with the customers. *www.framos.eu*

Moritex Opens German Office

The company has announced the opening of a new office in Munich, Germany, to directly service the company's rapidly growing German speaking customer base. Benefiting from more than 25 years experience and expertise in lighting and vision Moritex made the decision to set up the new office after the interest shown in its products at the Vision 2006 show in Stuttgart. Formed as a subsidiary of Moritex Europe the Munich office will provide an applications laboratory staffed by two technical specialists, offices and a stock of the company's comprehensive range of market-leading telecentric lenses, high performance LED lighting, halogen light sources and fibre light guides. *www.moritex.com*

Isra Vision Buys Majority Stake in Parsytec

The company acquired more than 52 % of the shares in Parsytec from the company founder and main shareholder Falk Kuebler and an institutional investor. Isra's management is pleased to have successfully concluded the transaction. With its high-quality products and services for surface and web inspection in the metal and paper industry, Parsytec has achieved a leading position on the global market. Since Isra is not yet so well established in these industries and has mainly expanded in the industrial automation, glass, speciality paper, printing and plastics sectors to date, the product ranges of both companies complement each other perfectly. *www.parsytec.de*
www.isravision.com

New Metrology Applications Team

Nikon Instruments has recruited two experienced industrial applications specialists to ensure that users of its next generation manual metrology and video measurement systems derive the maximum benefit from advanced features. The company has also appointed a new Industrial Sales Manager to coordinate all aspects of its customer support in this growing sector of its business. Paul Gough joins Nikon as Business Development Specialist for Metrology & Video Measuring Systems straight from Hexagon/Tesa Technology. In addition to periods as an assembly production, a development and a design engineer, Nikon's new Metrology Application Specialist, Phil Wilson, worked for Renishaw. And Nikon has promoted Bill Clement to Industrial Sales Manager. *www.nikoninstruments.eu*

Chromasens Receives Siemens-Award

Chromasens has been honoured with an innovation award by Siemens. The company specialises in the development and production of high-end camera systems for colour image capturing and processing. The proceedings took place during this year's Suppliers' Days in mid June. A total of 10 out of 1000 suppliers were honoured for their work. With this distinction, Chromasens has been recognised for its "Exceptional performance in the development of innovative camera concepts for fast colour image capturing". The innovation prizes, two in total, have been awarded this year for the first time. "We specifically value flexibility and competence in developing prototypes and products in a very small time frame, independent of whether dealing with the control card, the sensor or the lens", Siemens continues. *www.chromasens.de*

Isra Vision One of Germany's Top Innovators

The company is one of the 100 most innovative small and medium-sized companies in Germany according to this year's nationwide Top 100 corporate bench-marking competition. Now in its 15th year, the aim of this competition is to seek out outstanding examples of innovation management in Germany's SME sector. Lothar Späth, former state premier of Baden-Württemberg, awarded this prestigious seal of approval to Isra Vision at an official ceremony in Stuttgart. Isra, which supplies turn-key solutions for the detailed inspection of surfaces, fully automated assembly equipment as well as locating and positioning equipment, was particularly impressive in the „Successful Innovations" category. *www.isravision.com*

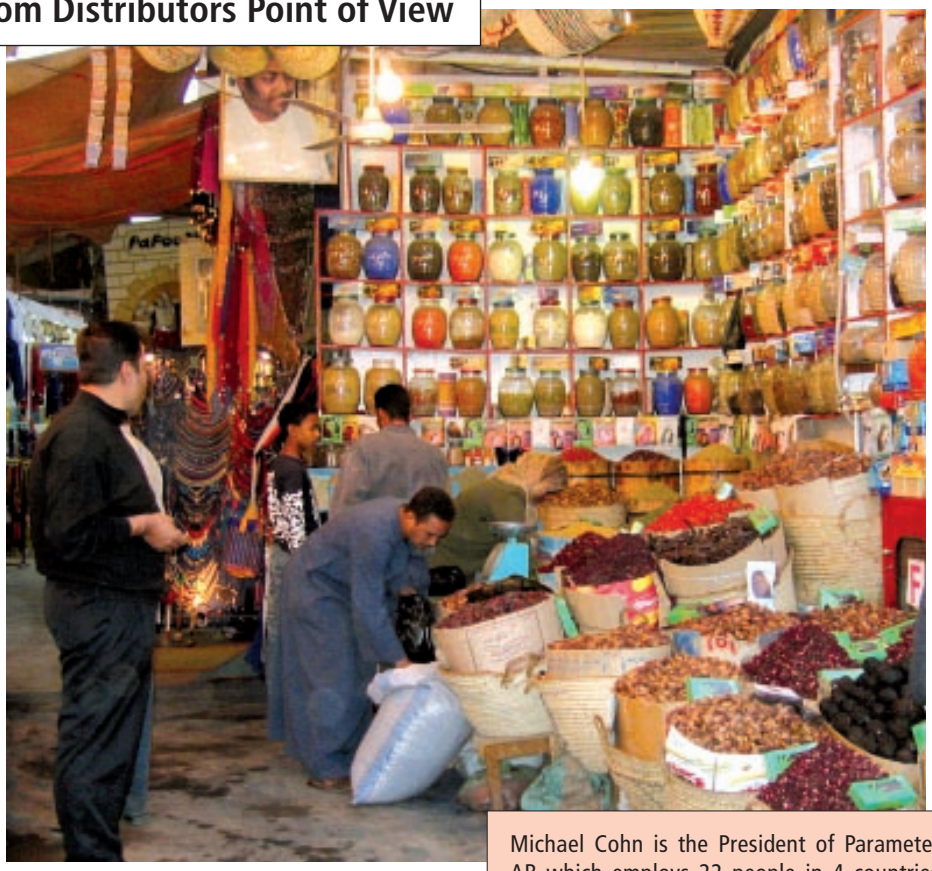
Adept Technology and LMI Technolgies Sign Agreement

Under the terms of the agreement, Adept will provide LMI with a license to Adept HexSight software and trademark. LMI will market and support HexSight products on a world-wide basis in addition to development of new products. Adept will gain access to LMI's enhanced state-of-the-art technology, allowing the company to maintain their award winning vision guidance products. "LMI has established itself as a leader in the vision inspection business with immediate access to a broad base of customers and markets," said Robert Bucher, CEO of Adept Technology. "The Hexsight software portfolio is in perfect alignment with LMI's long term objectives by expanding our innovative engineering and vision technology", states Leonard Metcalfe, Chairman & CEO, LMI Technologies.

www.sensorsthatsee.com
www.adept.com.

Is the Distribution Model Still Valid?

Building Markets from Distributors Point of View



In the past 40 years, the world has changed at an ever faster pace. This, of course affects the role of and the way an independent high-tech distributor operates. I will describe our role from the point of view of an independent distributor in smaller geographical markets and in a relative immature and high-tech market such as machine vision.

Michael Cohn is the President of Parameter AB which employs 22 people in 4 countries and is dedicated to high-tech distribution in Optronics and Imaging.
Parameter AB has its origins from 1967 in a number of family owned high-tech distribution companies. Since 1987, when Parameter AB was founded, it has grown to be the largest independent distributor in the machine vision market in the Nordic countries and recently opened a Polish subsidiary.

The Market

Today Europe is comprised of 50 countries with approximately 700 million people and speaking more than 25 languages. A crude measure of the markets sizes, using GDP tells us that Germany, England and France represent at least 50% of Europe's industrial market. The next 20 countries make up an additional 45% of the total market. Just the cultural challenges between countries are huge.

It could be tempting to focus on the three largest countries and forget the rest.

This would be a risky strategy. In a global economy one doesn't know where business is generated and each local market has segments and clusters with globally dominant players. Hearing aids in Denmark, tile inspection in Spain and Italy, paper and wood in Sweden and Finland are some examples of such segments.

For a manufacturer to be dominant and competitive he has to create global volume. This is especially important in a small business area like machine vision. Profit for any larger manufacturer is generated from global synergies and local customer value. To create volume in manufacturing, the objective must be to acquire enough local market shares and thus be able to afford new product developments to further support local needs. Not an easy trick! Here the local distributor clearly plays a role.

The Challenges of the Machine Vision Market

According to the market studies of EMVA and AIA and our own analysis the component machine vision market in the Nordic countries is only about € 35 million. The relative size of the market is the same as for one of the large automation company's sales of photo cells in Sweden or their whole turnover solely in Denmark. In addition, it is fragmented in many different market segments, like wood, paper and pulp, biomedicine, manufacturing, telecom/electronics, food industry, etc. making it a very horizontal market. Machine vision customers also have very different behaviour and are divided between OEMs (small and large), system integrators and end-users.

To add a value in the machine vision market, the distributor needs to market and sell a wide range of related complementary products from cameras to optics, illumination and software. A machine vision sales organization therefore must integrate know-how from several disciplines like physics, electronics and software. Training the sales organization and building the know-how out of the varied competences and complex products are long-term investments and a major management challenge.

However, without focusing on the specifics of machine vision technology, it is very hard to grow business. A sales organization where vision products are a small part of a larger assortment of auto-

mation products or is mixed with system integration, is seldom successful. In an inherently complex market, these organizations do not have the necessary focus to offer relevant, new products along with qualified, technical pre- and post-sales support.

How can such a complex business as machine vision reach a critical mass to be stable and profitable long term?

There is only one answer – the distributor, together with its suppliers, has to create true synergies and added value in the market.

The Impact of Internet

Internet has introduced transparency and easy access to technical information, available suppliers/products and in some cases global pricing. It was believed that the "middleman" could be skipped. The biggest advantages of the internet have been for customers and manufacturers in very small niche markets or "communities", usually too small, to be interesting for a distributor.

A relatively small company like Parameter AB has taken advantage of what the internet and IT can offer, at a low cost. It has enabled us to grow into more than five countries operating with a minimum of overhead and have information available at a key stroke for sales and support staff alike. Response time has decreased significantly. In short, internet is a great business tool.

Machine Vision is now growing into a broader market. Manufacturers need local feedback on new applications and new niche segments that can be developed into volume sales. A local sales organization that operates horizontally is the tool to find these new markets.

The overflow of information and marketed products now found on the internet requires customers to find a partner, to help guarantee, that he can use the product and will get support that solves his or hers specific problem. Remember, we are dealing with complex products and solutions where the customer's expertise is usually elsewhere.

Delivery and quality problems have to be dealt with. The close integration of hardware and software in cameras causes support questions we earlier had only with frame grabbers and PCs. Modifications to products often need to be implemented in order to give the customer the solution he needs for his project.

In short, the focused distributor can create value for manufacturer and customer alike. This distribution model is as valid today as it was 40 years ago, albeit a little harder to make profitable.

Barriers to Growth

The distributors' goal is to establish a customer relationship with the major customers in their area. Building know-how and markets is a long term commitment. This is crucial to success for supplier and distributor alike. However good the technology or the price, there are certain pitfalls that can be barriers to growth.

Competitive Lines

In order to build critical mass, the distributor has to expand

Exhibiting with demos at local trade shows is important but costly and time consuming

Gustav von Heijne, application support manager at Parameter at a course given to customers in Finland

product offering with complementary products and new technology as well as sales into new market segments. Over time, there will inevitable be competitive overlap between some suppliers' products. For example, many suppliers of cameras offer similar products, but in many cases the products have different target markets and design considerations. In order to create a critical mass for the distributor a certain overlap must be accepted. The criterion of acceptance of this has to be if the distributor is going to grow the product line and supply the manufacturer with his local market share.

Multiple Channels

When there is limited success, multiple distribution channels is a tempting way to sell into the market. The distributor may continue to take sales opportunities or keep his captive market. However, the risk of not getting return on the investment over time or sell at decreasing profit margins, will ensure that the local sales person will not put his heart into selling those products.

Discount Structures

A small local market can never make or break volume manufacturing. Smaller territories, in fact, have higher cost of sales per unit sold. Before globalization, the distributor could compensate the smaller volume with a higher price. A volume-based discount structure will, in small markets, often act as a barrier to growth. Local OEMs will also be at a disadvantage compared with those from larger territories. A flat discount rate enables the distributor to handle their own business strategy, make faster decisions to take market share and reduces administrative costs that the handling of discount structures introduces.

Quality

Lack of quality kills profitability not only in that we focus on the wrong issues, but it also erodes the trust between distributor and supplier. Reliability, a high service level and delivery precision build trust between distributor and supplier. In return we gain brand recognition through satisfied customers and a dedicated and positive sales force.

What it boils down to is, that the sales person wants to look good in the customer's eyes. Quality, trust and communication are the name of the game!

In Conclusion

The market for machine vision is fragmented and horizontal where manufacturers need a local distributor for added value. The distributors may have a problem with focusing and profitability in such a small and complex market place. To keep focus on sales in machine vision, there is a need to build a critical mass of sales with complementary or even "competing" suppliers.

Barriers to growth in smaller markets are overcome by long-term commitment, quality products and building know-how and trust between suppliers and manufacturers.

Distribution, creating global value with local presence

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www.parameter.se

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GIT VERLAG
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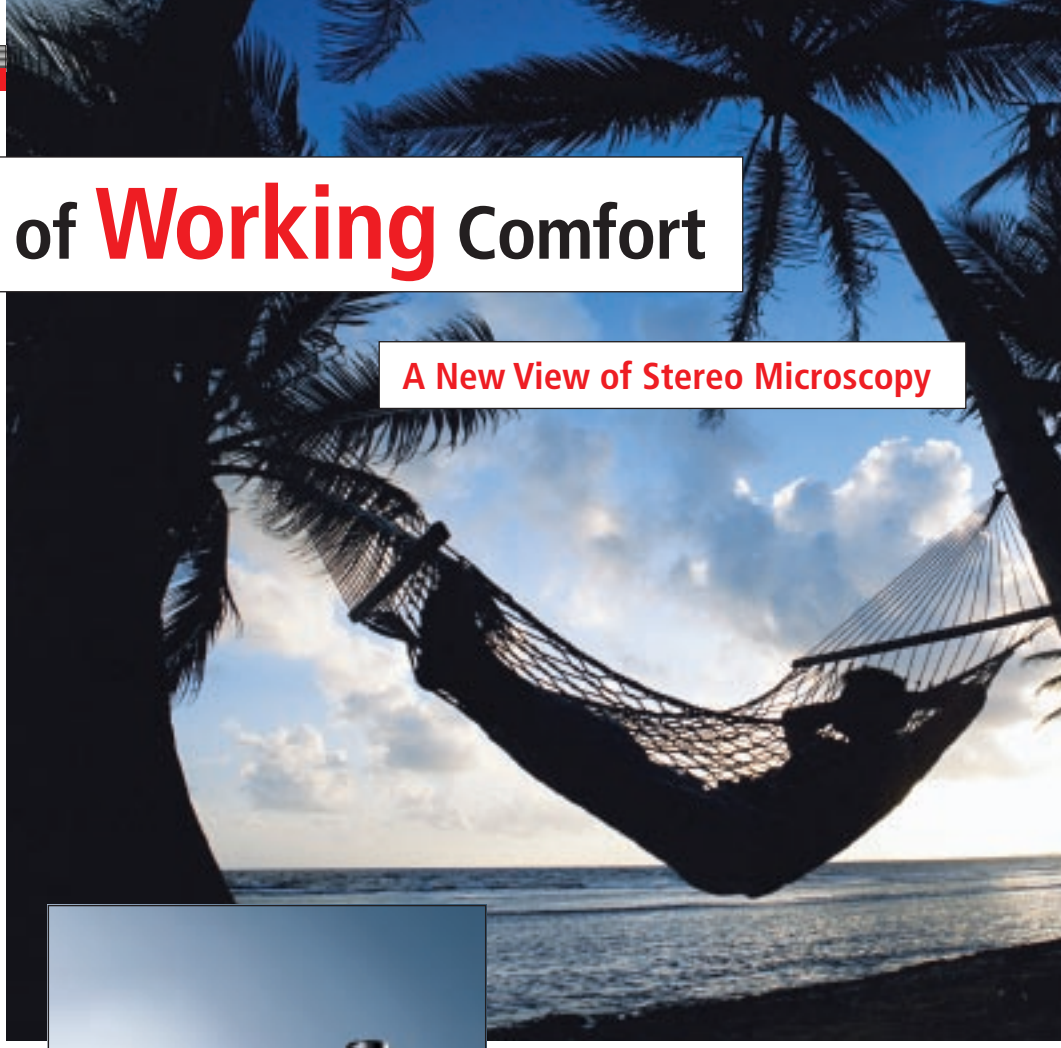
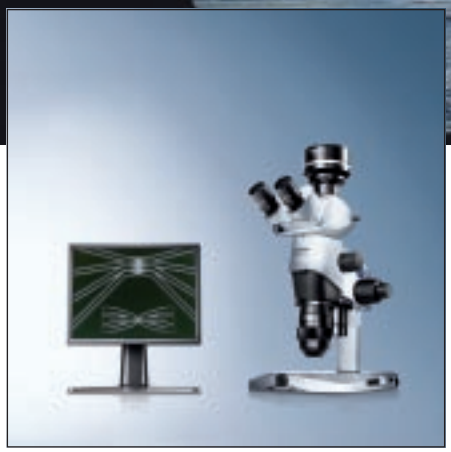
The Next Level of Working Comfort

A New View of Stereo Microscopy



In recent years, microscopy has been undergoing a renaissance, driven by the significant role played by optical microscopy in industrial applications, as well as issues concerning ergonomic aspects of the instrumentation. It is important that the capabilities of research and inspection equipment must keep pace, but there are also a number of clear optical and non-optical requirements that must be met. Olympus has been at the forefront with both the development of improved materials and applications and the ergonomics of the instrument. From high-resolution and large zoom range to user comfort and flexibility, the new SZX2 stereo microscope series has been designed to combine superior optics and enhanced ergonomics with significant advances to enable an extended range of techniques.



Olympus SZX16 research stereo microscopy system

Stereo microscopes are now widely used in the semiconductor industry as well as for precision engineering and biotechnology. They are designed for lower magnifications compared to standard compound systems. The Olympus SZX2 range of stereo microscopes contains two top class instruments, which have been specifically designed with different optical systems and superior technology features to meet all industry and materials science needs. The SZX10 stereo microscope has been introduced for advanced routine and identification requirements, whereas the SZX16 has been developed for detailed research and inspection procedures.

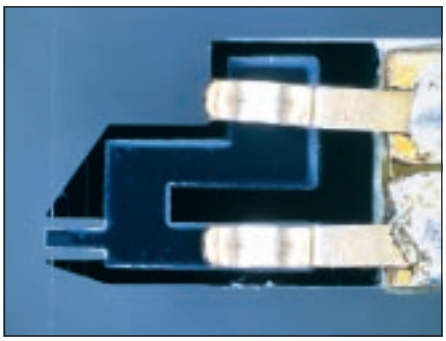
In the Comfort Zone

Amongst a number of key improvements implemented in Olympus microscopes, such as extensive illumination choices and complete software solutions, a lot of attention has been paid to ergonomics. Being in one position for too long while using whatever piece of equipment, can lead to large levels of stress and fatigue and many people sit in unnatural positions at their microscopes. For stereo microscopy, the eyes are also often fixed in one position for long periods in an effort not to lose the image, leading to eyestrain and increasing the potential for head and neck aches. In addition, the users hands are in unnatural positions when reaching high for a focusing control, contact stress on the forearms may result from resting on the work surface edge and working at a microscope that is not at the correct height and angle requires a hunched position.

Olympus microscopes are now designed with a great deal of flexibility and modularity because one size does not always fits it all. The SZX2 range, however, is both ergonomically and aesthetically pleasing. A number of special ergonomic features have been included to allow a much more comfortable experience, which makes finding and retaining images a lot easier. These features include different eyepiece tubes; low-down and easy-to-use control dials, suspension arm and stand systems, parfocal adjusted objectives, as well as ComfortView eyepieces for more relaxed eye positions.

Functional yet Comfortable

All the components of the SZX2 series have been designed to provide the perfect optical system, with the ultimate in user comfort and design. The body frame brings all adjustable features toward the user, while its solid build provides maxi-



Microfingers (Courtesy of Stiftung caesar, Bonn, Germany)

Highly versatile: Olympus SZX16 with digital camera DP71

mum stability and fine control of all functions. The zoom controls are easy to reach and use, which means that only minimal forearm movement is necessary to easily change or manipulate specimens. In addition, its shorter length enables a lower eyepoint, making it possible to utilise larger working distance lenses without losing a comfortable position.

The Fine (Focus) Difference

The focus drive is probably the most frequently used control on a stereomicroscope. Therefore, Olympus has paid the utmost attention not only to making it easy and comfortable to access, but also to making its operation as precise and smooth as possible. The SZX2-FOF fine focus unit enables a smooth operation and precise setting, not previously possible.

Observe from Anywhere

Stereo microscopes can be used whilst seated or from standing positions and the SZX2 range can be fitted with various binocular and trinocular observation tubes. This enables comfortable viewing from either or both, even more so by using the ergo-tube developed for this very purpose. The convergence angle between the eyepieces has been optimised on SZX2 observation tubes for more relaxed vision. The tube can be moved between 5° and 45° (to horizontal), enabling excellent personalisation, essentially fitting the microscope to a multitude of users and not vice versa.

The SXZ2 series can also be fitted with a trinocular head and moving objective in the axial imaging pathway, which optimises images for 2D photography, as well as precision measurements.

For Your Eyes Only

Spending a large amount of time continuously looking through the eyepieces on some stereo microscopes can lead to eye strain. The Olympus ComfortView eyepieces have been carefully developed to enable a significantly larger range of eye movement, making it easier to form the stereo image. This reduces the occurrence of eyestrain, making both short and long term use much more comfortable, without losing the 3D effect.

Flat and Flexible

Traditionally, transmitted-light sources for stereo microscopy have required stands with bases over 80 mm in height. This can lead to pain in the arms, as well as an unfavourable posture due to the increased eyepoint. The ultra-slim SZX2 LED transmitted-light illuminator with its 40 mm height is not only half as thick as conventional light bases, but is also the most ergonomic stage height available. In addition, the LED stand provides a stable platform for increased working comfort, as well as being an important source of illumination in many procedures that require transmitted illumination.

Olympus also offers a range of stands and suspension arm systems for the SZX2 stereo microscopes that allow users to move the microscope to the right position using a single fingertip. These various arm types and mounting possibilities provide the flexibility to configure the stand system to specific needs and environments, and also allows the microscope to be brought to heavy or large samples.

Microscopes for All Applications

As the range of microscopy techniques increases, Olympus has made major advances across its extensive product groups to enable all users to benefit from the next level of stereo microscopy. The advanced stereo system of the SZX2 series combines superior optics and ergonomic design to optimise both operator safety and comfort. The SZX2 series provides the latest technology and optical quality and performance features for all material science inspection and quality control applications.

Cover page: Image courtesy of Stiftung caesar, Bonn/Germany

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Laser 2007

The Whole World of Photonics

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Laser 2007. World of Photonics has confirmed its status of the world's biggest trade show on photonics technologies. The concomitant scientific congress has grown into the most important conference in this field in Europe. Participants of both events were excited about the high quality of the meetings and showed a solid optimism for further progress in photonic technologies.

The Laser. World of Photonics, born 1973 in Munich, is today a biennial trade show for optical technologies. For several years already it has become the world's biggest event in this field. This year from June 18–21 more than 25,000 visitors came to the fairgrounds in Munich to see 1,008 exhibitors (2005: 948, a plus of 6.3%). In comparison, the Photonics West in San Jose (USA) counted about 17,000 visitors this January. The next Laser. World of Photonics will take place on the grounds of the New Munich Trade Fair Centre from 15–18 June 2009.

It is the „place to be" for all leading companies in the photonics industry. It is an excellent place to meet (or to listen to) the leading figures of the community from both sides, the industrial and the scientific.

Strong Market Growth

It has become a good tradition to use the Laser show for a review of the market development in photonic technologies. Spectaris, the German industry association for optical, medical and mechatronical technologies gave a prognosis of 11.5% growth in revenue for laser sources and optical components in Germany in 2007. Arnold Mayer (Optech Consulting) organized the 8. International Laser Marketplace, a one day meeting for market analysis and technology reviews. He calculated the size of the global market for laser machining systems in 2006 at about € 6.1 billion, an increase of 27% compared to 2005. Gerhard Hein from the VDMA (German Engineering Federation) estimated the

The World of Photonics Congress unites about one dozen different conferences and workshops with several thousand presentations in total
(© Messe München)

value of the systems production at about € 1 Billion.

Growing Presence of Chinese Companies

With 55 exhibitors the People's Republic of China has achieved the third place among the exhibitors from outside of Germany, behind the USA and Great Britain. Laser technologies are also experiencing substantial growth in the domestic Chinese market. Consequently, the number of exhibitors present at Laser China. World of Photonics is increasing every year.

Klaus Dittrich, Managing Director of Messe München International

The World of Photonics Congress

The World of Photonics Congress started already on Sunday, the 17. June. It is a unique event that covers all of photonics. Topics range from the latest research and development including basic research, medical application, as well as lasers in manufacturing, sensors and industrial image processing to discussions about physical processes in new light sources. The congress unites about one dozen different conferences and workshops with several thousand presentations in total. Unfortunately, the number and the independent organization of the events made it a bit challenging for visitors to follow the program. On the other hand, it was a unique event for the different societies to meet and communicate with their members.

Formula of Success

Klaus Dittrich, Managing Director of Messe München International, honored exhibitors of many years within the framework of the opening event and explained that „The success of Laser. World of Photonics is due to the fact that its concepts have been developed further in collaboration with the industry and that it continually took up new topics important for the companies. The global market meets here, successfully business relations are established and business is made."

More information can be found at www.world-of-photonics.net.

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Embedded System VS. Smart Camera

Two Competing Systems Paradigms at Vision 2007?

Smart cameras have experienced an enormous boom in recent years. Their advantage: they are self-sufficient, not requiring an external PC, as they are capable of independently processing and evaluating their own captured image material. Other solutions are also available, such as compact or embedded machine vision systems. These are also located directly at the machine, but their eyes – the cameras – are positioned separately. They have also commanded considerable attention recently. Are the systems truly competitors, or do they complement one another?

This exciting topic will be also the focus of Vision 2007, from 6–8 November. As the world's most competent and complete meeting of the industry, the leading international trade fair for machine vision and identification technologies will be taking place for the 20th time this year. "Compared to last year, we are already 20 percent up in terms of net exhibition space," explained Sandy Zorn, Vision 2007 Team Manager at the Stuttgart Trade Fair Centre.

The wealth of potential uses for industrial machine vision is matched by the broad range of technical solutions. A trend can be clearly made out toward distributed intelligent on-site systems, however. The market currently offers two competitive solutions in this respect. "Embedded systems generally involve processing systems with integrated frame grabbers based on either PC processors or digital signal processors (DSPs). The camera is external and connected via a cable. In many cases, multiple cameras can be connected to an embedded system. In smart cameras, on the other hand, the camera and processing unit are integrated. Their computing power is limited and is generally much lower than that of embedded systems," explained Leutron Vision Managing Director Meinrad Simnacher. Michael Engel, Managing Director of Vision Components and a pioneering developer of smart cameras, does not see performance differences between the competitive systems: "A smart camera is essentially an embedded system. Our flagship, for example, features 1GHz Texas Instruments DSP technology and a processor performance of 8,000 MIPS. This is a level of performance that matches the most powerful pure embedded systems using the same processor family."

The integrated monitor and membrane keypad for programming the SAC VisionCube system directly are especially convenient

Simply comparing processor performance is not enough, however; other aspects must also be taken into consideration. "If space requirements play a decisive role, smart cameras have a clear advantage," explained Peter Klima, Managing Director of SAC. "Embedded systems are the better choice if multiple cameras are required for a single application, however." The price advantage of a smart camera system can quickly melt away in such situations. According to Sayed Soliman, Managing Director of MaxxVision, the strengths of smart cameras can be found mainly in the footprint and in the fact that they require very little in the way of peripheral equipment. On the other hand, embedded systems can make do with a smaller camera head, have a wider range of supported cameras and provide greater freedom when choosing interfaces. "Embedded systems also support the simultaneous deployment of matrix and line scan cameras," Klima added. The SAC Coake software also supports graphical programming on the system directly or via a notebook computer. Third-party image processing libraries can also be integrated with ease. SAC, for example, deploys embedded systems such as the VisionLux compact system for the surface inspection of injection-moulded rubber parts. Multiple cameras – both matrix and line scan – check the parts for imperfections such as scratches, blisters or inclusions of foreign matter. "At Vision 2007, we will be presenting special tools for surface inspection and 3D applications, as well as systems that support six

Smart cameras, for example the Vision Components flagship, are becoming increasingly powerful despite their low space requirements

In practice, the MaxxVision VisionBox line is used primarily for real-time applications, thus employing for example the Chromasens Aleos MCS high-speed colour line scan camera

cameras," explained SAC press spokesperson Miriam Schreiber.

In the case of applications involving more than one camera and requiring a large selection of interfaces, embedded systems are at a clear advantage. "Our compact LVmPC is one of the smallest and most powerful systems with support for up to 16 analog and digital cameras," said Simnacher. The Leutron Vision system has proven its value in the packaging industry and other sectors with configurations such as two CameraLink framegrabbers to support three CameraLink line scan cameras and a Gigabit Ethernet camera. The question of the best configuration is ultimately one of the user's requirements, however. "Our strategy is therefore founded on the versatility and flexibility of our solution options," Simnacher continued. "For example, OEM users have the choice of 28 different image sensor types for our PicSight Smart cameras, and we will be introducing new sensor types at Vision 2007. A variety of interfaces, such as Gigabit Ethernet, are available as well."

Vision Components (VC) smart cameras are characterized by their ruggedness and suitability for harsh manufacturing environments, such as those that occur when butt-welding studs on automotive bodywork. Smart cameras are used to control the welding robots in such situations. However, with their ability to handle web speeds of up to 12 meters per second and very high shutter speeds for jitter-free imaging, VC smart cameras are also deployed in the printing industry for tasks such as registration mark monitoring. VC is continuously pursuing the further development of its smart cameras. At Vision 2007, for example, the company will be presenting eXcite2, the first intelligent stereo camera with two parallel sensors.

For the Managing Director of MaxxVision, an important property for any system – be it smart camera or vision box – is the ability to "set it and forget it". "Like a sensor or a stored program control system, machine vision systems should be components that simply work, and which should remain available in an identical state – right down to the firmware version – for many years," Soliman explained. As far as the costs are concerned, Soliman pointed out that users must always take the total cost of ownership into account, including personnel costs for implementation, configuration and maintenance – a point frequently forgotten by decision-makers. In the intelligent camera sector, MaxxVision will be presenting four new products of the Sony SmartCam 2nd Generation at Vision 2007. As far as embedded systems are concerned, MaxxVision will be presenting the VisionBox Quad – a passively cooled embedded device with four image processors in a compact housing – together with a Chromasens high-speed colour line scan camera.

"In future, embedded systems will become even faster, more powerful, and will support even more cameras," Klima summarized. Simnacher sees the future in a more differentiated manner: "Specialized embedded vision systems will be losing significance thanks to digital camera interfaces such as GigE, USB and Firewire. Framegrabbers will no longer be a general necessity. Under those circumstances, 'normal' embedded industrial PCs will be up to the job. We therefore expect digital cameras with GigE interfaces and smart cameras to become the dominant machine vision solutions." Further trends in machine vision will be presented by leading industry experts at the popular Industrial Vision Days at Vision 2007.

The intelligent Leutron Vision PicSight Smart cameras offer OEM users the choice of 28 image sensor types and an integrated Gigabit Ethernet port

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The European Vision Summit

5th EMVA Conference in Lyon Unites 19 Nations

Founded in May 2003 in Barcelona, the European Machine Vision Association currently has 99 members representing 18 nations. Its aim is to promote the development and use of machine vision technology and to support the interests of its members – machine vision companies, research institutions and national machine vision associations. The main fields of work of the EMVA are: standardization, statistics, public relations and marketing. The associations main event is the annual EMVA Business Conference which this year took place in industrious but still charming Lyon, France.

With more than 150 participants from 19 countries the EMVA Conference once again reached a record number of attendees. Throughout the event, attendees benefited from ample networking opportunities, one of the primary goals of the conference. Four different conference sessions focused on machine vision in France, technology and business trends as well as machine vision markets. Attendees received first-hand information on vision markets in France, Japan, China and Europe – all of it novel and previously unpublished. The way to success in non-manufacturing markets was naturally convincingly presented by Dr. Norbert Stein, Vitronic. Increase of business and profit were illustrated from two different angles : through pricing excellence (presented by Dr. Diether Tillmann of Simon, Kucher & Partners) and by putting stock in your distribution channels (Michael Cohn, Parameter; see also our feature article in this issue). State of the art in technology was lectured by Dr. Angel Rodriguez-Vazquez, Anafocus, with the outlook to miniaturizing the whole vision system to a chip and by Dr. Eric Marchand, INRIA, with an overview about the latest in visual servoing in robotics applications. Last but not least the conference warm-up was expertly done by Christel Paris-Bicking, Crossroads, by enlightening the audience with the cultural approach to do business successfully in France as a non-french company.

This is what attendees said about the EMVA Conference 2007:

"It was my first visit to the annual EMVA Conference and I am pleased to have such a great take-home value. The talks were more than worthwhile to listen to and networking was just excellent. I will come again!"
Dr. Olaf Munkelt,
CEO of MVTec Software GmbH, Germany

"It is very worthwhile attending the EMVA Conference, since the topics of the Conference are always very interesting. We are very eager to spend so much effort for further standardization by cooperating with EMVA."
Shigeo Oka,
Chairman of the Japanese Industrial Imaging Association (JIIA), Japan

Nicolas Parascandolo, Club Vision Symop, presents the French Vision market

Record number of attendees with more than 150 participants from 19 countries

Networking is always one of the primary goals of the conference

"Nearly the only chance to meet colleagues from all over Europe and even some world key players in a private atmosphere together with high value information about the European and world market and research."
Dr. Norbert Stein,
General Manager & Sole Shareholder of Vitronic GmbH, Germany

"We are a new member of EMVA. This was my first attendance to the EMVA Business Conference. I found it extremely useful, made many contacts and I'm leaving the conference with a lot of homework to do…"
Prof. Aytul Ercil,
CEO of Vistek A.S., Turkey

"The EMVA Business Conference provides a great opportunity to meet people and to bridge the gap between academia and industry."
Prof. Tieniu Tan,
Acting President of China Society of Image and Graphics (CSIG); Director of CAS Institute of Automation, China

"The EMVA Business Conference was perfect for meeting new contacts as well as existing colleagues in the MV market."
Peter Bhagat,
Managing Director, Gardasoft Vision Ltd., UK

"This time we were so impressed by the enthusiastic atmosphere with many more attendees than the previous year. The contents of the conference were very informative and interesting. We expect you to organize another successful conference in Berlin next year.
Hiroshi Takaoka,
President & CEO of Toshiba Teli Corporation, Japan

EMVA continues its dynamic growth course and currently has 99 members from 18 nations. Two new countries – Israel and Turkey – are now additionally represented. The EMVA welcomed three new members during the conference: Infaimon S.L. (Spain), Univision s.r.l. (Italy) and EVT Eye Vision Technology GmbH (Germany).

Mark your calendar today: the next EMVA Conference will be held on April 11th and 12th, 2008 in Berlin, Germany.

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North American Vision Market Intelligence

Market growth in Machine Vision by Nello Zuech

For machine vision companies selling into the US market, it might be interesting to know, how the market developed in 2006 and what is expected for 2007. As always, the following information is only a small excerpt from the quarterly newsletter of about 60 pages.

Based on the final results from the public companies for 2006 we estimate the North American merchant machine vision market to have grown even more than we originally thought in 2006 – about 17.7% reaching $1,561 million with most of the growth driven by application-specific machine vision systems targeted at applications in the semiconductor and electronic industries.

The North American market for configurable machine vision products (frame grabbers, smart cameras, embedded vision computers, etc.) increased 7.5% to $340.8 million. The value added by North American merchant system integrators to configurable machine vision products is estimated to be about double the value of the products themselves – $680 million. This then suggests that the total North American machine vision market in 2006 was $2,241 million. At the same time, the North American merchant machine vision industry saw revenues increase 17.8% to $3,211M from worldwide sales, while the North American suppliers of configurable machine vision systems saw their worldwide sales increase 10.2% to $584.9 million.

At the end of the first quarter of 2007, year-over-year sales were up some 14.5%. Our survey of companies participating in the North American machine vision market suggests that in the second and third quarters of 2007 more anticipate the market will be somewhat better than in 2006. Looking at year over year projections we see the respondents as being more optimistic in the beginning of 2007 than towards the end of 2006. While predictions for corporate earnings (mine included) have been pessimistic suggesting single digit quarterly year-on-year growth, in the first quarter growth continued at double-digit levels. The list of industries key to the machine vision industry seeing four consecutive quarters of improving profits over the last four quarters continued to increase. And, with the most recent quarter 14 industries key to spending for machine vision had positive earnings growth three out of the last four quarters. These are likely to be industries that will start to or continue to invest in capital equipment. So although earnings and capital spending of some of the major machine vision user industries may be off, the minor user industries may take up some of the market slack in 2007 as they have the wherewithal to increase capital spending so the overall downturn in the machine vision market may not be as bad as it could be.

Since 1983 Vision Systems International (VSI) has been an independent and impartial engineering and marketing consultancy specializing in machine vision and inspection automation technologies. VSI publishes a quarterly Machine Vision Newsletter designed to support the management of companies in the machine vision industry to better understand the machine vision market with the objective of assisting them to grow their business by alerting them to business trends and potentially new opportunities. The annual subscription price is $500.

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The European Machine Vision Association (EMVA) has currently close to 100 members representing 18 countries. EMVA aims to be an industry lobby to support the interests and concerns of its members, the companies, research institutes and national associations of the machine vision industry. The main activities to ensure that this world-leading technology is widely applied are: standardization, market studies and surveys, annual business conferences, European and regional networking events, PR and marketing.

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emva
european machine vision association

VISION 2007 - world leading trade fair for Machine Vision.
VISION will be held for the first time from 6 to 8 November 2007 at the New Stuttgart Trade Fair Centre which has direct connections to Stuttgart Airport.

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VISION 2007

Tuning Your Application

Image Processing Basics: Optimizing Process Time Smartly

Foto: suncom (photocase.de)

Machine vision applications on the factory floor usually have to keep pace with the work cycle of the manufacturing process. For most applications, a proper image processing method will be at hand or an algorithm may be developed, but sooner or later the systems engineer probably will be short of processing time. Purchasing a "better" (that is, a faster) processor may be the intuitive way to tackle this problem, but just boosting your processing power is a quite naïve approach. This article tries to broaden the view and gives some examples for optimizing the processing time by generally looking for simple methods in every system component.

Keep It Simple

Tuning your application does not mean to make your algorithms as fast as possible. Usually, an application engineer will design a machine vision system to signal the result back to the process within the time interval given by the frame rate of the application. The frame rate in turn will be dictated by the manufacturing process. In order to keep pace with the frame rate, much more must be taken into account than only the processing time of the code for the image processing routine. The response-speed of the photo sensor, the delay between trigger and strobe or the duration of data transfer to the CPU are just some examples. In general, the whole system must be designed to signal back to the process within a given time interval. On the other hand, it is by no means necessary to develop a vision system which is much faster than the process. A certain amount of overdesign is a good idea, since applications tend to evolve towards higher complexity once they are in operation, but much better performance than necessary usually means a more expensive solution than necessary.

Image processing experts are tempted to develop a certain form of single-mindedness: they are trained to understand, apply and implement complex algorithms, but sometimes tend to ignore that much simpler means may be sufficient to solve the problem. Usually, the simpler solution will be the better solution. It will be (at least potentially) faster. It will allow for less effort in testing and maintenance. Design, implementation and documentation will be easier for a simple method than for a complex algorithm. This quite traditional approach is, in a broader sense, well-known as "Occam's razor". Every engineer is trained to focus upon the problem and to find and keep the solution as economical as possible, which is just another way to state Occam's principle. Needless to say, every marketing manager will also think along this line. For an overdesigned product, sooner or later someone else will develop a more cost-effective alternative. It's a jungle out there, and like the tiger, the fierce competitor is waiting just around the corner.

Fig. 1: Dark-field lighting of a coin enhances the edges on the surface

Handling

Clever handling of parts to be inspected on a conveyor-belt, e.g., may significantly simplify your application. When the position and orientation of a part are well defined, the subsequent image processing routines become much simpler. The field of view may be much smaller than with huge tolerances for the position, allowing for less pixel resolution. When the position of the edge of an object is known within 20 pixels, e.g., it will be much simpler and faster to find the edge compared to the situation with parts floating through half of the image area. Even more impact upon the reduction of processing time will be achieved, when the parts are delivered with a well-defined orientation. It can be very difficult to develop robust algorithms for objects with random orientation. Usually, in such situations the orientation will be determined, and the image will be rotated to show the object in a well defined position. The subsequent image processing steps thus become independent of the method for detecting the orientation. Standard procedures for measuring the

Fig. 2: Dark-field lighting of embossed numbers on a shiny surface

orientation and rotating the image, however, are not simple and consume a lot of processing power. Handling or guiding the parts with mechanical means to fix their position and orientation in the field of view may add to the mechanical complexity, but will markedly reduce the image processing complexity of the application.

Regions of Interest

Another simple method to reduce complexity is the use of regions of interest (ROI). Most industrial image processing applications will allow the operator to define parts of the image as special regions, where certain tasks have to be performed. A certain area on a label, e.g., may be defined for checking the lot-number by OCR. In this case, the rather complicated image processing operations required for character recognition are applied to the ROI only. This will result in much shorter processing time compared to the application of the method to the whole image. Since the image regions outside the ROI are completely ignored, this will also result in better stability of the application. With well defined position and orientation of the parts, the ROI may be defined in absolute pixel coordinates. When parts come along with random position and orientation, the proper position of the ROI can be fixed after detection of the boundaries of the object or according to certain characteristics of image areas. If you imagine a label, e.g., you may start with a search for the barcode-region and subsequently define a narrow, long rectangle perpendicular to the bars as a simple region of interest. Needless to say, a ROI may have an arbitrary shape, but rectangles aligned with the coordinate-axes will be preferred for easier implementation.

Simplify with Light

Proper lighting will further simplify your application. When the surface characteristics of the parts are varying or are irrelevant, it is a good idea to place the object between light-source and camera, whenever possible. This will produce images with very good contrast, and the predominant feature will be the contour of the object. Thresholding of the image will thus be very simple. Whenever the objects have to be viewed in remission, a well defined lighting will be most beneficial. The machine vision unit should be placed behind a curtain, in a tunnel or some other device to make sure that the influence of ambient light is eliminated. Lighting usually should be designed for a homogenous illumination of the field of view. Inhomogenous illumination will lead to severe complications in the segmentation between objects and background. In some cases, these effects can be compensated by a shading-correction, but this method consumes a lot of processing time. Even segmentation with an adaptive threshold, which takes care of variations of intensity through the field of view, has to calculate a correction factor from the neighbourhood of each pixel and will become quite time-consuming. Generally, every lighting method which enhances the features of interest in the image will reduce the complexity of the image processing algorithms and thus will accelerate your application. Two examples are shown in Figure 1 and 2. Both images where taken with dark-field illumination. The edges on the surface of the object clearly show up in Figure 1, and the embossed numbers have good contrast on the shiny surface in Figure 2.

Undersampling and Partial Scanning

Computational load in image processing sometimes simply is due to the huge number of pixels in the image. Even if your application just needs a field of view with a pixel resolution of 100 x 100 pixels,

there is no choice but to use a standard camera with 752 x 582 or 768 x 494 pixels. With several CMOS-cameras, however, readout can be restricted to a predefined rectangular ROI. This will considerably reduce the amount of data to be sent through the interface and to be processed. Some CCD-cameras are capable of binning, which means integration over rectangular groups of pixels during readout. This technique also results in an image with lower pixel resolution in the image buffer. Another method to reduce the number of pixels from a camera chip is partial scan, where readout is terminated after a certain number of lines. Partial scan may end up with an image of 752 x 100 pixels, e. g., with a standard detector chip. Several further variants are available, and it may be useful to get in contact with a qualified camera vendor to find an appropriate hardware configuration for reduced pixel resolution. Some of (but not all) these options will also yield higher frame rates, since the pixel-clock frequency is not affected by partial scanning. Whenever the frame rate is the bottleneck, partial scan may be the solution.

There are, however, applications, where high pixel resolution really is necessary, but not always in the same region of the image. Imagine a really small high-density 2 D-Code on a surgical instrument hand-held in front of a code-reader by a nurse in an operating room. Since the position of the code within the field of view can by no means be predetermined, the necessary pixel resolution has to be provided for the complete image. In this case, one of the first steps in image-processing will be to locate the 2 D-Code. Various methods may be appropriate for this task, but let us assume something sophisticated like a Hough-transform algorithm or a pattern-matching in search of the L-shaped finder-pattern at the edges of the code. These are quite demanding tasks in terms of computing-power. The processing time can be drastically reduced in such cases by undersampling the image, which means to choose a subset of pixels. As an example, every second pixel in every second line might be picked. For most purposes, this resolution will be sufficient to locate the code or at least to restrict a more detailed analysis with full pixel resolution to a few small regions. Undersampling by a factor two in lines and columns reduces the number of pixels by a factor four, directly yielding roughly a factor four in processing time. For some methods, the effect of undersampling is squared, which is the case in pattern-matching, where the pixel resolution of the pattern will also be reduced. There are lots of problems where four-fold or even higher undersampling in lines and columns is quite feasible, sometimes

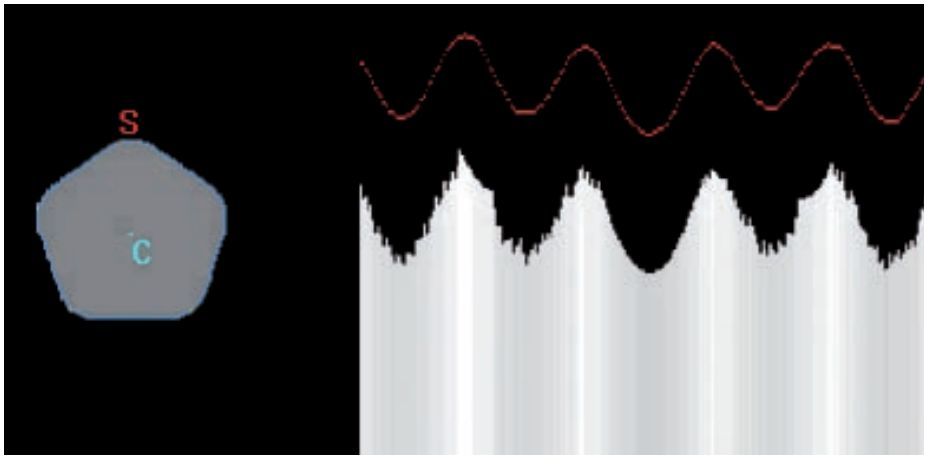

Fig. 3: An object and the corresponding polar-distance plot. C marks the center of mass of the object, S the first contour pixel in the polar-distance-plot

reducing the computational load by orders of magnitude.

Reduction to One Dimension

Several problems in image processing may be reduced to one dimension. For decoding a barcode, the grey-level profile of a single line perpendicular to the bars will in most cases reveal the necessary information. Even dealing with five or ten parallel lines for better reliability will substantially reduce the computing-time compared to traditional approaches such as labeling, filtering with an edge-operator, thinning and then measuring the distances between edges. For better signal quality, the barcode can be projected to a straight line perpendicular to the bars, resulting in a simple one-dimensional grey-level distribution. Even quite complex features of objects can be calculated from one-dimensional representations. As an example, Figure 3 shows an object and its polar-distance plot [1]. After thresholding, the center of mass and the contour are calculated. Then, the distance r from the center of mass to the contour is determined for several directions, denoted by the angle ϕ between the x-axis of the image coordinate system and the radius vector. By scanning the full range of 2π and plotting the distance r as function of ϕ, the contour is represented in the resulting polar-distance projection, shown in the right part of Figure 3. The red curve is the radius function after application of a simple filter operation to the original contour-plot to reduce the noise originating from the discrete structure of the detector array. Since the contour of a convex binary object completely describes the object, the polar-distance plot contains all the information, but in a one-dimensional structure. As an example, the number of corners of an object can quite easily be determined from this representation. Counting the relative maxima of the function, in this case, directly leads to identification of the object as a pentagon. As an additional advantage, this method is independent of the rotational orientation and of the size of the object. On the other hand, the position of the relative maxima on the ϕ-axis can be used to determine the rotational orientation of the object.

Further Aspects

There are much more examples for simple approaches to seemingly complex problems than the few given in this short article. The integrity of an object can often be checked by counting pixels in a ROI rather than using blob analysis [2], edges can be found by probing with "arrows" rather than with edge filters, or distances may be ranked by use of the taxi-metric instead of the Euclidean metric, to name just a few more topics. Industrial image processing has developed a huge number of very successful and powerful applications based on simple ideas, and it is always worthwhile to think along these lines. Nevertheless, some aspects related to hardware should be mentioned. Believe it or not, but the video-memory may have a tremendous influence on the processing time. Since image processing means to move around lots of bytes, the processing-time can be completely dominated by the response time of the memory chip. Another well-known drawback is to let your CPU manage the data-transfer from the frame grabber instead of using a DMA-circuit. This may easily waste 10 percent or more of the computing power of the system. The calculation of trigonometric and other complex functions should be avoided whenever possible. If these functions are really needed, it may be possible to generate a look-up-table (LUT) in advance. The discrete structure of the image plane usually allows for discrete angles only. A look-up table thus may be long, but limited to those angles which can occur in the problem. Many frame grabbers support LUTs in hardware, thus providing a very efficient method for calculations based on the grey-level of single pixels. Even more powerful is hardware-support by FPGA-boards. In these devices, "pixel-crunching" like filter operations are performed on the data-stream from the camera with a negligible time-delay compared to the time scale of the corresponding image processing routines in software. And finally: when looking for a more powerful processor, the clock-frequency is important, but the architecture may be equally important. DSPs are optimized for processing of loops, and whenever the whole image is scanned by an algorithm, a DSP with a low clock-frequency may be the better choice than a "faster" processor with a different architecture.

References

[1] by courtesy of Felix Krumbein, Diploma thesis, Darmstadt University of Applied Sciences, 2001.

[2] Ch. Heckenkamp, INSPECT 2, 2001

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No Risks or Side Effects

Smart Cameras in the Pharmaceutical Industry

VISION COMPONENTS IN BRIEF

Vision Components GmbH was founded in 1996 by Michael Engel, inventor of the first intelligent camera for industrial applications. Today, it is a leading supplier in the field of industrial image processing. The Ettlingen-based company develops and distributes intelligent, network-compatible real-time cameras. Due to their proprietary multitasking operating system VCRT, the devices operate without an additional PC, making them easy to integrate into almost any industrial facility. Typical application areas include quality and completeness checks, measurement technology and biometric access control. The intelligent cameras are approx. 50 times more compact and ten times more cost-efficient than conventional PC-based image processing stations.

Products
Smart Cameras (high performance-, sensor- and single board cameras), Complete Vision Systems and Software.

Vision Components®
The Smart Camera People

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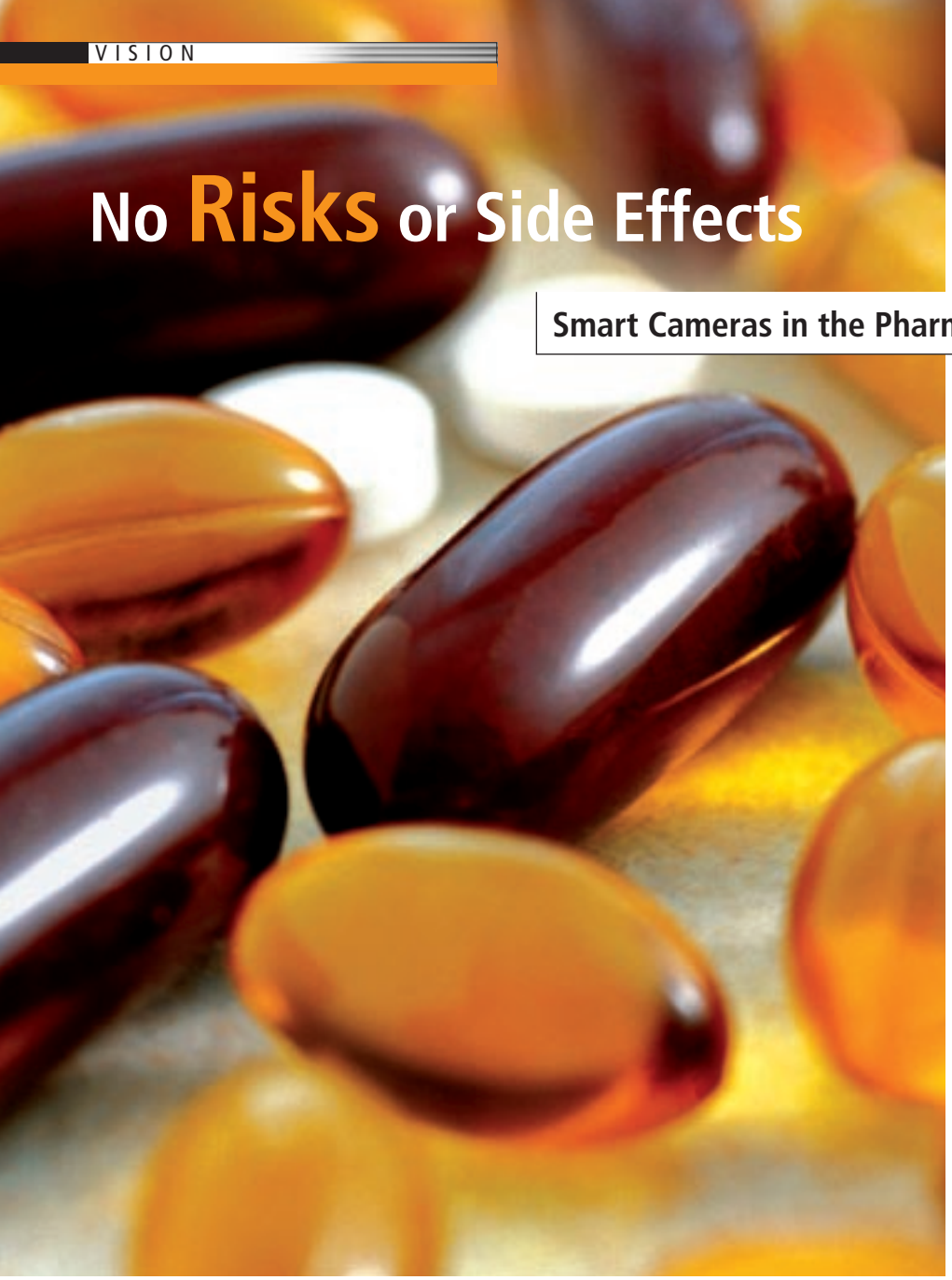
No Risks or Side Effects

Smart Cameras in the Pharmaceutical Industry



Due to strict product quality and safety requirements, quality control in pharmaceutical applications is an exceedingly demanding process. Amongst other things, labels and package inserts need to be placed correctly – faulty packages, insufficient identification, product mix-ups or damaged packaging may have unpredictable consequences. Therefore, computer-based quality checks are the only option for thorough, cost-effective and sensible product control. However, conventional industrial image processing systems consisting of a camera and an additional PC usually are too complex and cost-intensive. They also require much space and are not universally suitable for rugged or hygienically demanding environments. Intelligent cameras on the other hand, which provide the computing power of a modern PC and execute all image processing routines, are easy to integrate into almost any plant or machine.

The PCE Product Control Camera, which is based on VC4038-type intelligent cameras from Vision Components (VC), is especially designed for use in pharmaceutical applications. The camera head, lighting unit, optics and CCD sensor are encased in a GMP-compliant IP 54 housing which is optionally available with a higher protection class. Measuring just 60 x 40 x 61 mm, the camera head can be installed in tight machine spaces. A separate control unit measuring 160 x 60 x 80 mm houses the processing electronics. The units can be operated and configured either via a PCE terminal featuring an LCD display or by means of other input devices such as laptops connected via Ethernet. An integrated illumination unit consisting of 48 white LEDs enables the measuring of small objects on a close range. External illumination units (top-down or bottom-up LEDs) are available for larger objects. The sensor has a standard resolution of 640 x 480 pixels; a 1,280 x 1,024 pixel resolution is available as well. The camera system features two digital inputs and outputs, an RS 232 interface (Ethernet or RS 485 are optionally available) and an SVGA monitor input.

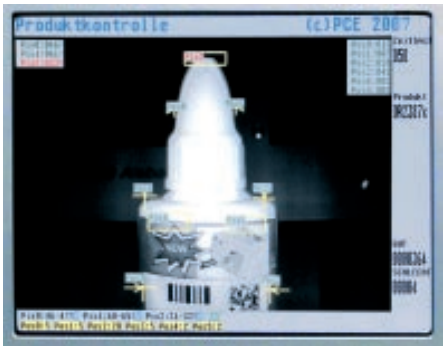
Independent Quality Control

The core component of VC Smart Cameras is a digital signal processor. This functional principle enables the product control system to quickly execute even demanding tasks. It is designed to recognize predefined characteristics and to detect the presence and position of pack-

Pharmacontrol

Pharmacontrol Electronic GmbH, which is based in Zwingenberg, specializes in modular control systems for quality checks of pharmaceutical products and packaging. The company, which was established in 1989, offers a product portfolio comprising control sensors, code reading systems and complex image processing solutions suitable for complex tasks. All products are designed according to GMP requirements; versions complying with FDA 21 CFR Part 11 regulations are optionally available. Through close cooperation with users and packaging manufacturers, PCE ensures optimal practical usability and full compatibility with all standard packaging machines.

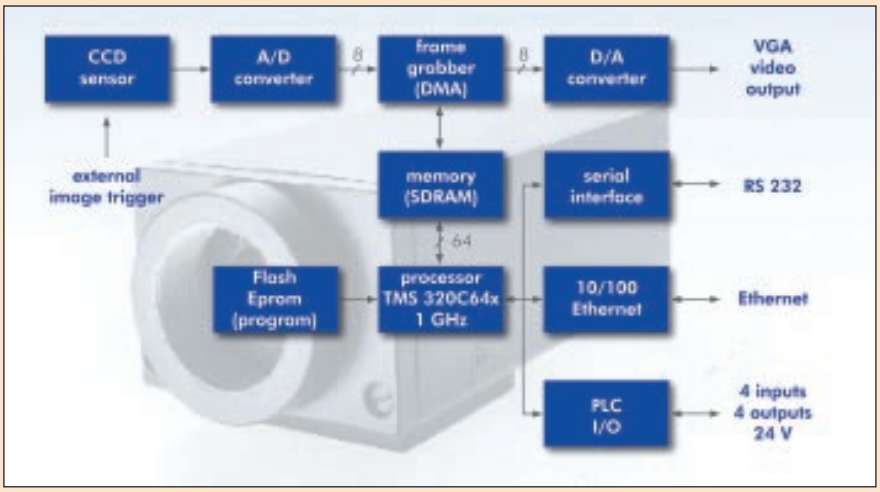
Product control camera during operation



PCE Product control cameras analyze a maximum of 30 measuring windows simultaneously

aging and products. Capable of simultaneously checking the presence of up to 12 characteristics and the position of up to 18 characteristics, it provides a maximum of 30 measuring windows per picture. The system measures circles, ellipses and rectangles and detects or counts objects with a measuring accuracy of 0.2 mm. Requiring 5 ms per window, the system can analyze up to 600 objects per minute. The reading distance can be chosen between 50 and 150 mm. The units are suitable for stand-alone and network operation – the latter can be coordinated by means of the software tool Pharmacontrol Pilot.

Smart Cameras



Block diagram of a VC44xx-type camera from Vision Components

Smart Cameras from Vision Components act as stand-alone image processing systems. The real-time, network-capable devices integrate a CCD sensor, a fast processor (such as a TMS320C64x-DSP from Texas Instruments in VC44xx-type cameras), a frame grabber, image storage capacity and all required interfaces. The intelligent cameras are approx. 50 times more compact and ten times more cost-efficient than conventional PC-based image processing stations. Requiring neither hard drives nor ventilators, they do not need to be housed in a control cabinet and provide increased reliability. In addition to standard Smart Cameras, Vision Components also offers highly compact IP65/67 sensor cameras including optics and LED illumination as well as intelligent board cameras without a housing which are particularly suited for OEM applications. In VC cameras, image recording, which can be triggered externally or internally, is carried out by a CCD sensor with a resolution ranging from 640 x 480 to 1,600 x 1,200 pixels. Depending on the sensor resolution, the frame rate can be chosen between 10 and 242 fps. The Linux-like proprietary operating system VCRT ensures real-time capability. All camera functions can be operated via its integrated shell, which also allows users to execute file operations, start programs and recall TCP/IP statistics. The file system is protected against power failure; and shutting down simply requires switching the power off. The Smart Cameras can be freely programmed in C and C++, allowing users to adapt them to specific applications.

Flexible and Pharma-Compatible

The PCE camera system is suitable for a wide range of tasks, including the counting of blister packs, controlling the content of folded boxes, controlling the cap position on bottles and the label position on boxes, fill-level monitoring, checking bottles and vials for glass breakage and measuring syringes. Recurring configurations can be stored in and recalled from a product database. The freely programmable cameras can be easily adapted to new configurations. The systems are also suitable for use in plants and machines subject to validation – they come with batch protocol and password protection functions. Moreover, models complying with FDA 21 CFR Part 11 („Electronic Records, Electronic Signatures“) regulations are optionally available.

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Overcomimg the Barriers

Expanding the Role of Vision in Food Processing & Packaging

Machine vision, particularly 2D, has been playing an increasing role in automation of food processing and packaging. Expanding application areas in this industry has faced several barriers, including cost, complexity of integration and operation, and needs for multiple inspection functions. Described are recent developments in vision tools to overcome these barriers, including availability of high speed 3D smart vision sensors, and high speed synchronization technology.

Unlike most manufactured parts, which have a defined nominal geometry, food products have a wide variety of shapes, textures and colours. Food may require inspection for size, shape, volume, and colour. Requirements for sorting may be complex, such as segregation into a number of shape or colour categories – ideal applications for machine vision.

Dimensional Measurement

As one example of requirements in food processing, consider quality assurance of protein products, such as poultry, fish and meat, which are some of the higher value foods, offering excellent payback periods by reducing waste.

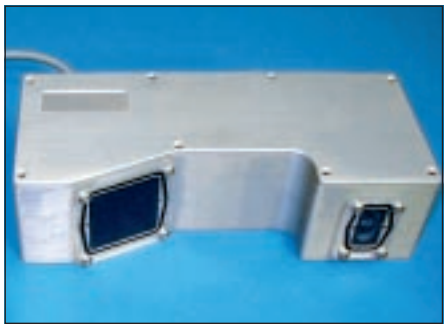

Fig. 1: LMI CertiView Sensor

Geometric inspection requirements for protein products often include measurement of length, width and height, area covered or volume. Accurate measurement of volume can be particularly useful for packaging requirements. Also, products which have a consistent density can use volume data to estimate weight, an important parameter for the consumer.

Using 2D vision can only measure length and width. To overcome these limitations, 3D high speed laser line sensors for geometry inspection of food products have been developed, such as the LMI CertiView sensor (Fig. 1).

The generation of 3D data is only the first step in product inspection. Data must also be analyzed to extract the required measurement parameters on each item, and then measured parameters are communicated to the system control for proper disposition. A variety of dimensional analysis capabilities are available. These include length and width of product (independent of orientation), height, area and volume. In addition, the sensor is self-triggering, automatically starting when product appears.

To simplify implementation, the product does not need to be singulated in single file on the conveyor. The sensor will automatically detect and separate data from up to 20 separate products across the conveyor, as long as there is a gap between each item (Fig. 2).

Combining Colour and Dimensions

Applications for colour inspection include detecting defects, such as bruises, discolouration and detection of foreign material. Inspection using non visible wavelengths adds further automation capabilities, including the use of infrared or X-Ray sources to detect internal characteristics, such as fat content or presence of bones. Use of multiple cameras requires careful synchronization to insure that camera images cover exactly the same area on the product.

Complete automation of food inspection requires both colour and dimensional information. Traditionally, this would be implemented with two sensors, one for dimension and one for colour, re-

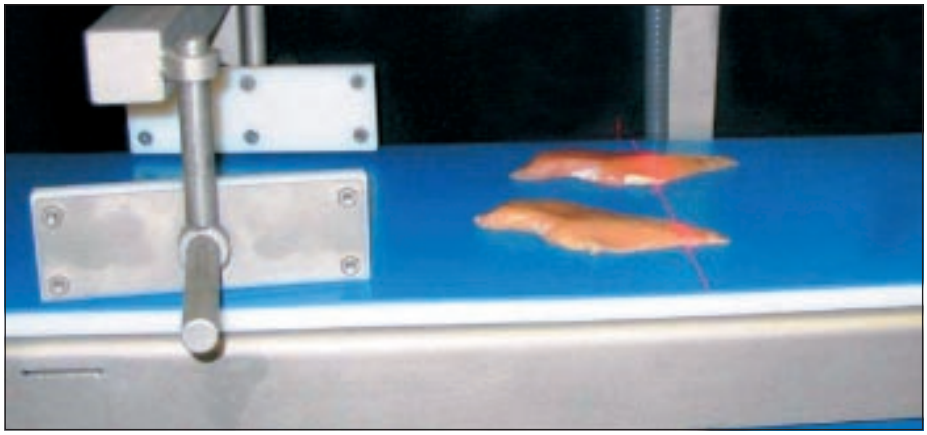

Fig. 2: Laser line measures 3D profile (photo courtesy of Cat2)

quiring a large amount of floor space, separate cameras and light sources, separate image analysis computers, and a means of synchronizing information from the two inspection stations to the sorting gates.

Recent developments in vision sensing have enabled the opportunity to implement a sensor with ability to inspect both 3D dimensional information and colour in a single sensor package (Fig. 3). Sensors with combined colour and dimensional inspection require synchronization of the illumination and camera frames. Laser and LED illumination must alternate at very high frame rates. Also, an encoder input from the conveyor is required to insure that frames are triggered at uniformly spaced points along the product, independent of conveyor speed.

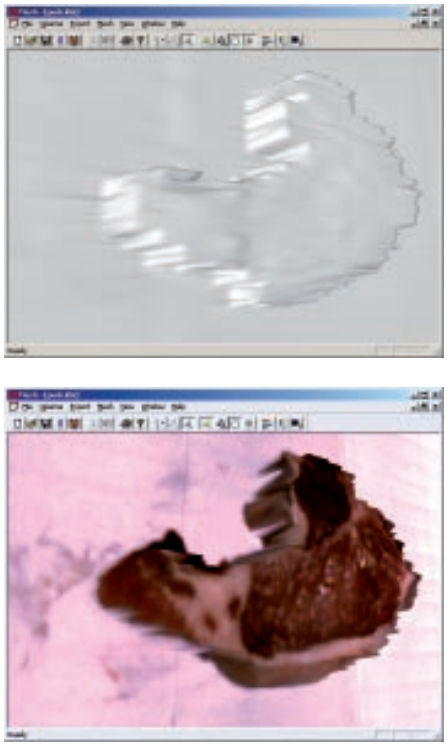

Fig. 3: Pork Chop 3D Shape (top), Pork Chop Color Image (bottom)

Simple Sensor Implementation

To solve these synchronization issues, and simplify implementation of multiple parameter inspection stations for the machine builder, the modular scalable LMI FireSync platform was developed. The platform has inputs for multiple vision sensors, encoders, and other types of sensors in the system.

At the sensor level, the platform supports modular sensor design, including laser and LED illumination, cameras and optics, light sources, processors, storage, networks, protocols, and software tools. The modular design provides the ability to easily configure sensors for a specific application family.

Where multiple sensors are used in an application, such as inspection on wide belts, the platform simultaneously sends an internal micro-second based time tag together with an encoder pulse count to every sensor in the system. This approach simplifies data analysis in the host computer, because profiles output by multiple sensors are tightly synchronized within the sensor system itself. Each full "slice" of data from the sensors is combined into a single complete data file.

Less Development Time

For food processing machinery providers, today's "Smart Sensor" capabilities with a selection of data processing algorithms included in the sensor package simplify the need for complex software development. Smart Sensors have both vision image processing and complex data analysis operating inside the sensor. This reduces system cost and complexity, and improves overall system reliability by minimizing the number of components and cabling required. This can include all decision making processing to determine if the product is good or bad, or sorting and packaging decisions, based on both dimensional data and colour information.

If the machine builder wishes to use his own proprietary analysis algorithms, the FireSync platform can combine 3D dimensional data with colour information into a single file of time stamped data, transmitted on a single Gigabit Ethernet cable.

Automated Packaging with Combined Sensing

Sensors that combine dimensional and colour information enable multiple parameter packaging applications, where multiple items are packed in trays. For a pleasing presentation to the consumer, it is often desirable to have all items placed in the package to have a uniform appearance, using colour information to sort product at the packaging station into uniform size and colour groups. Combining 2D/3D vision with robots allows automation of packaging of products with maximum customer appeal.

Increase in Function, Reduction of Complexity

The recent developments described provide many new opportunities for implementation of machine vision in automation of food processing. High speed 3D sensors provide detailed shape information for sorting of product at high speed. Smart sensors simplify implementation for the machine builder constructing the inspection station. Synchronization technology provides multiple function inspection based on both product geometry and colour, enabling automation of all manual inspection requirements.

Reduction in complexity benefits both the machine builder and end user, minimizing development time, maximizing reliability and providing a compact inspection station form factor for easy implementation.

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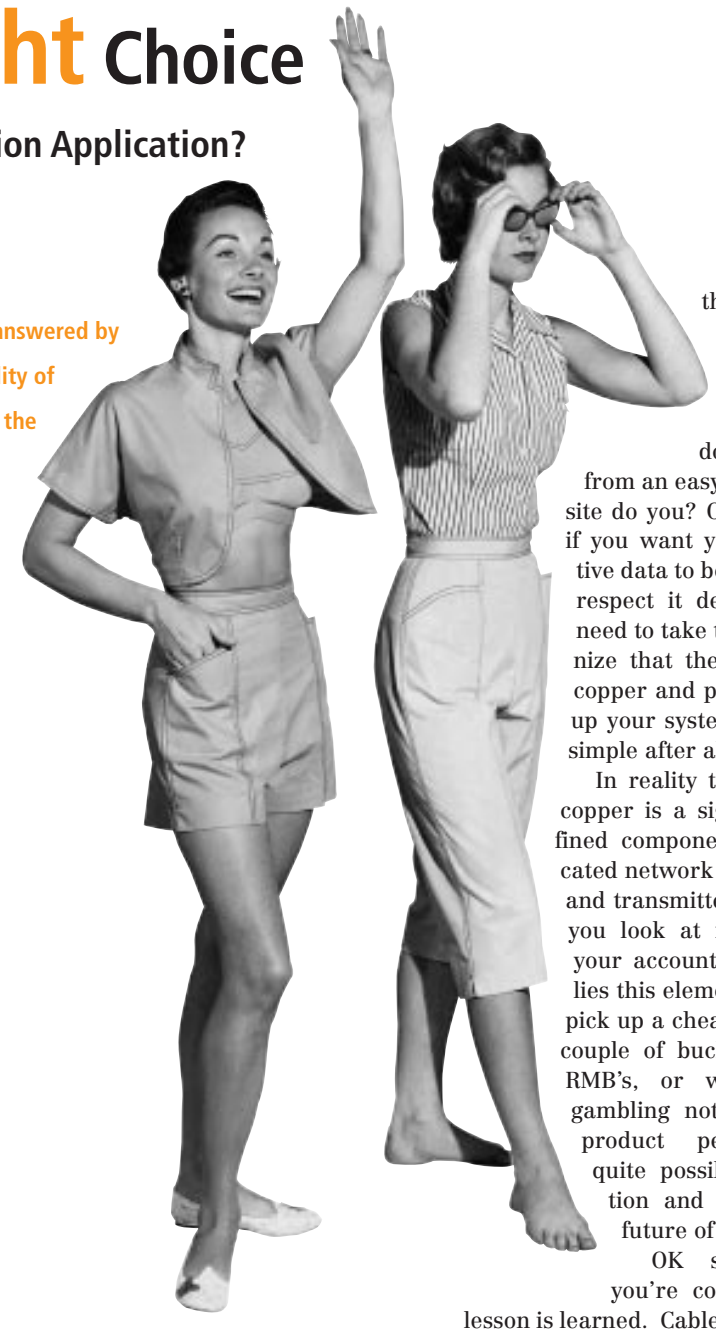
Making the Right Choice

How Important is Cable in a Vision Application?



How Important Indeed?

This is a case where one question might best be answered by asking a few others. How important is the reliability of the data you are transmitting? How important is the MTBF of your system? How much does it cost for you to replace a defective cable? And perhaps most importantly who gets the blame when a cable fails; your product or the cable?

Nine times out of ten no matter how you shake it if your data path doesn't work your product doesn't work.

It's hard for anyone to debate the fact that every aspect of a vision system is important. For example without some type of light source most systems can't 'see' an object. Without a lens there is no focal point. Without a sensor how do you gather an intelligible image? Without a processor and software an image can become useless. And so it is, in fundamentally every vision system used around the world regardless of the application. And that might be the end of it except, at some point virtually every vision system needs to transmit the data it has acquired in order to be useful. So how does that data get transmitted?

The Data Path

There are essentially three ways to move your data from one place to another.

There is:

1. Conductive core wire/cable (usually insulated copper or a copper alloy)
2. Fiber Optic
3. Wireless transmission

Regardless which of these three modes you use the integrity of the signal is the key to reliability. Simply put, if you can't get your data (all of it in tact) from one place to another in a timely manner your system will more than likely become useless.

Copper

This article will not discuss either Fiber Optic or Wireless; even though they are both extremely important data paths. For the sake of clarity we will only talk about the most common method of transmitting data; the copper wire cable.

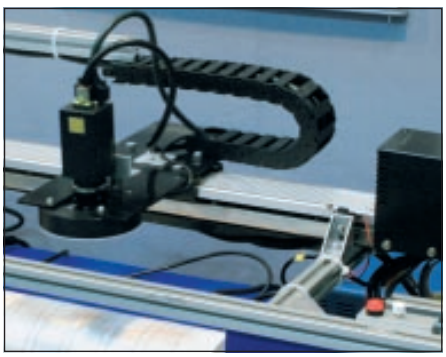
Cable, but how important can it be after all? I mean seriously, it's just a stretched out old penny covered with some kind of plastic, isn't it? What's the big deal? Why aren't you spending your time with more important things than cable? Besides you could probably just run down to the nearest discount outlet and grab a couple of cables at the last minute and shove them into your system. How sophisticated is cable? Oh sure maybe you throw in a couple of extra strands so it doesn't break as easily as solid wire (everyone knows that) but even at that it's not rocket science, right?

Wrong! You don't skimp on your lens? You don't pick up just any sensor chip that happens to be on sale; or grab a couple of light bulbs at the discount store or download software from an easy-access freeware site do you? Of course not and if you want your highly sensitive data to be treated with the respect it deserves then you need to take the time to recognize that the 'simple strip of copper and plastic' that hooks up your system may not be so simple after all.

In reality that simple bit of copper is a significant and refined component in a sophisticated network of data receptors and transmitters. And however you look at it, way down at your accounting's bottom line lies this elemental truth; if you pick up a cheap cable to save a couple of bucks (or Euros, or RMB's, or whatever) you're gambling not only with your product performance but quite possibly your reputation and maybe even the future of your company.

OK so maybe now you're convinced and the lesson is learned. Cable is important and you will give it the respect that it deserves; if not so much for cable's sake as for the sake of your product. So then how will you decide?

Mostly that depends on what you need.



GigE Vision camera, GEViCAM GP-21400C inspecting printing quality with flexible cable assembly

Common Vision Cable Types

In the Machine Vision industry luckily there are only a few recognized 'standard' types of cable. There are some less used cable types but the most common are Analog video (using coaxial conductors), Camera Link (including MiniCL and PoCL), Firewire, GigE Vision, USB and perhaps in the future HDMI.

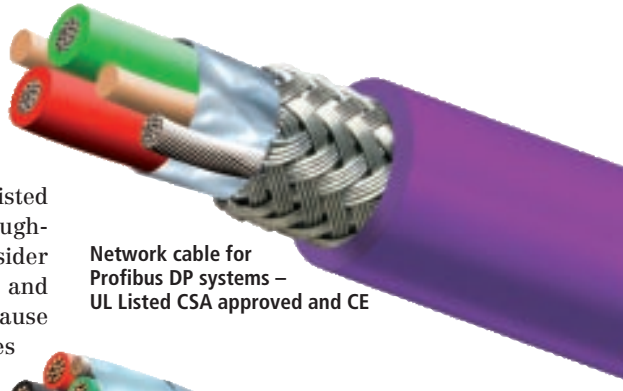
Getting the Right Cable

When you set out to select the ideal cable for your equipment you first need to make sure that the cable meets or exceeds the required industry specifications. Analog video cable needs coaxial conductors that are 75 Ω ideally with a tolerance of ~5 % to ensure the best performance. Camera Link assemblies including MiniCL must be certified and must meet the stringent AIA Camera Link Appendix D specification. PoCL cables need to meet Appendix D & E. (For a current list of registered cable products visit www.machinevisiononline.org). FireWire cable should meet IEEE1394a (400Mbps) or IEEE1394b (800Mbps). The GigE Vision standard doesn't directly dictate cable requirements but is designed to function with Category 5 or better cable. USB 2.0 should meet the USB-IF specifications and HDMI must meet all applicable HDMI transmission documents.

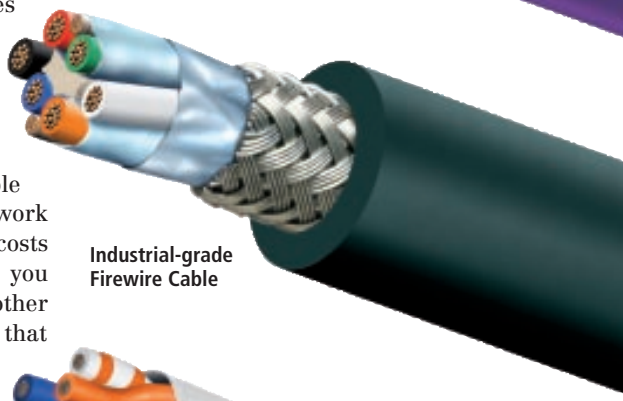
In most industrial applications flex life is essential even if you might not think it is so it's important that you check into the flex life expectations of the cable in your assembly; and you should know how it was tested and when. Ask to see the test data and documented results. How many strands of wire are used in the construction and is it an alloy? A seven wire strand configuration is typical for most standard products and nineteen wire strands are most common in high-flex cable. Those statistics will give you a pretty good idea of how you can expect the cable to perform when you need it to.

What about environmental concerns? There's RoHS certainly (everybody's meeting that), but what about an extensive temperature storage and performance range (for example +80 to -50 °C) what about resistance to UV degeneration for outside applications, or oil contamination, or abrasion, or water, or even to weld flash burns? If your equipment might end up in any type of factory environment (auto, pharmaceutical, food, wood, plastic, petro-chemical...etc.) then these are also important characteristics. That may seem like a lot to ask but it is possible to get cable with every one of those characteristics.

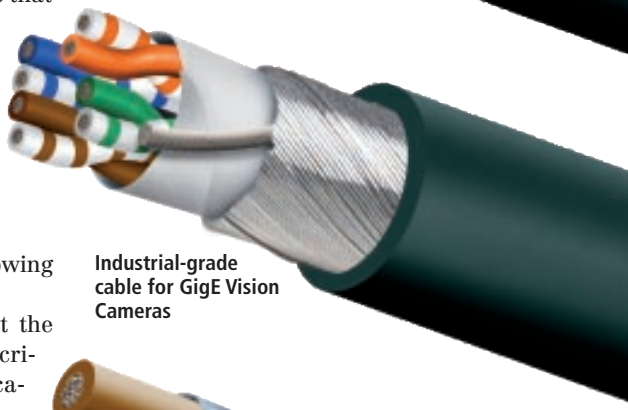
So how do you check into the environmental performance of the cable? One good way is to look at the material used for the jacketing. The most common jacket material is PVC but unfortunately PVC doesn't meet all of the previously listed requirements. If you need 'factory toughened' cable you should seriously consider a cable jacketed with a blend of PVC and TPE (Thermoplastic Elastomer) because this combination of materials gives you much of the function, performance and properties of a thermoset rubber (which is what you need) along with the process characteristics of a thermoplastic (that means it's cheaper than rubber for the cable manufacturer and the assembler to work with so it helps keep your overall costs down while providing the features you need and keeping quality up). Another unique benefit of the TPE material is that it has an attractive matte finish and it 'feels' better to you and your customers because it has an expensive 'rubbery-soft' touch.



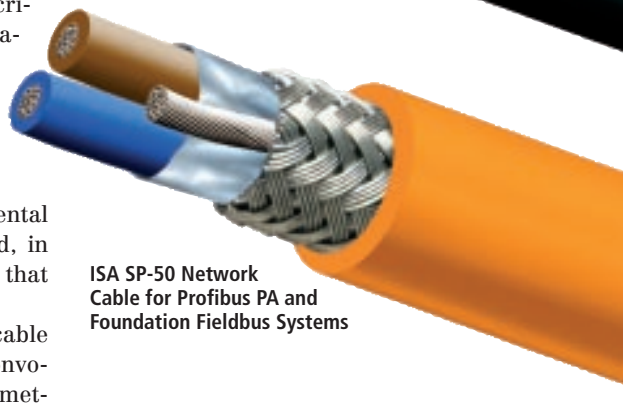
Network cable for Profibus DP systems – UL Listed CSA approved and CE



Industrial-grade Firewire Cable



Industrial-grade cable for GigE Vision Cameras



ISA SP-50 Network Cable for Profibus PA and Foundation Fieldbus Systems

So How Do You Pick the Ideal High-Performance Cable?

Start by going through the following check-list:

1. First and foremost; does it meet the established signal transmission criteria of the appropriate specification?
2. Does it perform mechanically with the flex life required by the majority of (or all of) your applications?
3. Does it meet all of the environmental challenges that will be presented, in the wide variety of applications that will make use of your product?
4. Is it a 'professional' appearing cable that is concentric with minimal convolutions and highly appealing cosmetics?
5. Is it a component that can be depended on to represent the high quality standards set by you and your organization?

Here's the good news if you pay close attention to the selection of this very important component you will soon witness the elimination of problems and aggravations caused by substandard cable. That alone will significantly offset any additional costs you may have when procuring a better cable. The 'right' cable is a cable that is truly worthy of being attached to your equipment and is one that compliments the superiority of your system's performance not undermines it.

And while you're making your decision on cables keep this in mind; cable is cheap and problems are expensive.

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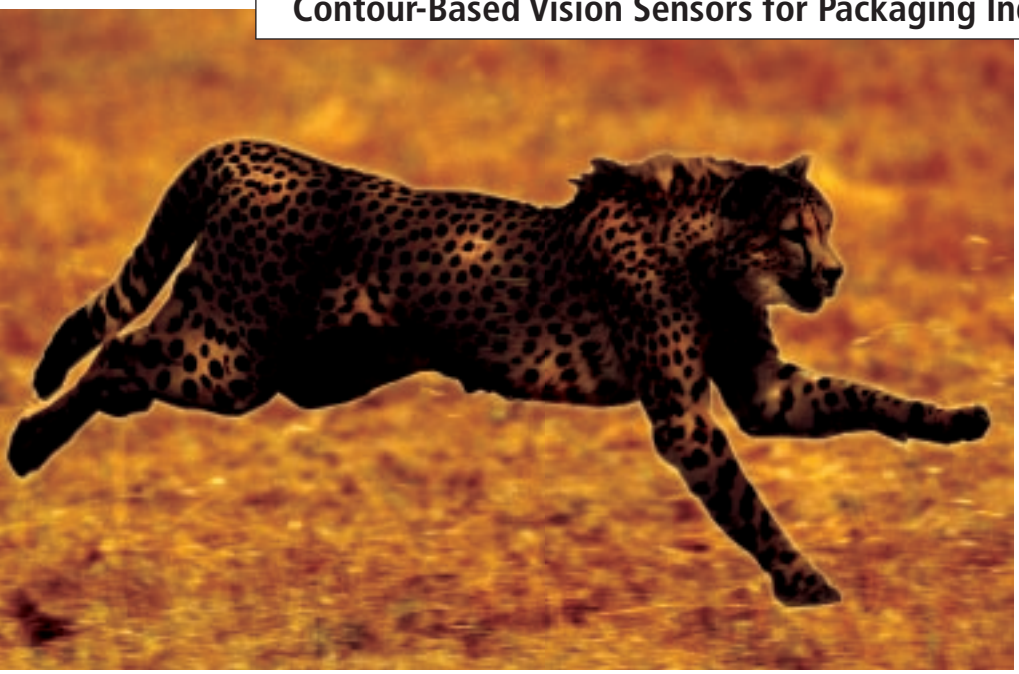
Powerful Contour

Contour-Based Vision Sensors for Packaging Industry



VeriSens vision sensors inspect presence and alignment of blisters within their package blanks in automated packaging machinery applications. With powerful tools for fast contour-based image analysis, challenges like different brightness of materials or optical reflections are mastered. The solution is highly stable against process tolerances.
Contours also allow for an intuitive approach. This feature is efficiently implemented into the graphical user interface. Even non-specialists in machine vision benefit from ease of use and fast setup.

Vision sensors close the gap between traditional photoelectric sensors and complex image processing systems. Just like a photoelectric sensor, the vision sensor provides a binary signal (OK/Not-OK) or a simple data set. However, in contrast to general machine vision systems, typical inspection tasks have been preconfigured with focus on straight forward parameterization and ease of use. A high level of process reliability is achieved without dedicated skills in machine vision. With their process vicinity and one-box design vision sensors are characterized by compact shape, simple mounting combined with a high degree of protection and industrial connectors.

Applications for photoelectric sensors are typically limited by the corresponding point-wise inspection geometry. Through their ability to detect objects via state of the art image analysis, vision sensors open up entirely new application areas. Vision sensors are of particular interest for all tasks, where a conventional vision system is simply "overqualified" and therefore too expensive. Quite a lot of these applications are found in packaging lines and packaging machines.

Little Sensor – Powerful Tool

The highly integrated and compact VeriSens vision sensors allow for more than 3,000 inspection per minute. Based on the primary grey image data, typical local inspections of intensity, contrast or blob analysis are provided. Nevertheless the powerful backbone of the product family is its architecture based on the Baumer FEX processor. This processor calculates in real-time all contours and edges within the grey value image data at high accuracy.

Contours allow in a natural way for robust geometrical inspection of specimen. The user's advantage is their robustness against variations in brightness by different types of objects, variations in external illumination or environmental changes. Even reflections may be tolerated. The user experiences this robust behaviour immediately during setup, because only a few parameter adjustments are required to get a reliable inspection result.

Geometrical inspection with VeriSens allows for evaluation and control of parameters like length, position, distance or orientation of lines, circles and arbitrary shapes. This intuitive approach based on everyday experience avoids overly technical terms and enables manufacturers to adjust and parameterize their inspection tasks within the convenient language of test and sensor applications. The overall setup procedure is supported with easy to use PC software. During run time the device operates as purely stand alone system with digital IOs or serial interface.

Up to 32 different features may be used for one single inspection of a typical

Fig. 1: In a vision sensor all components from illumination, optics and image sensor up to processor and interfaces are enclosed into one robust industrial housing for easy mounting and reliable operation

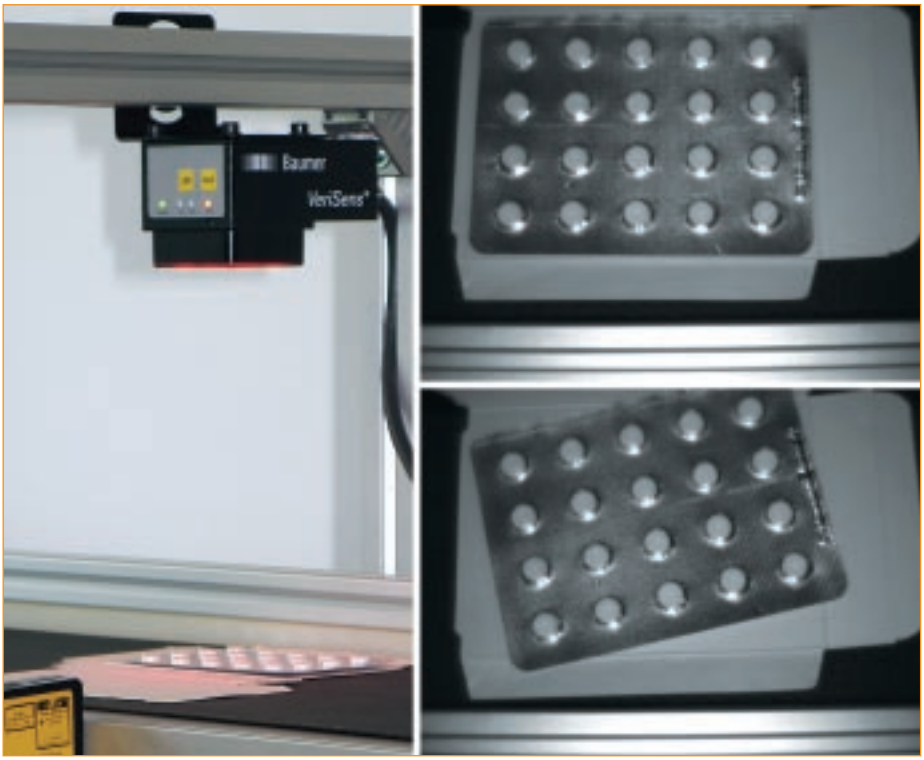


Fig. 2: The simultaneous inspection of cardboard blanks and blisters for positioning and correct alignment is completed with a VeriSens vision sensor at 600 inspections per minute : proper alignment (top) and misalignment (bottom)

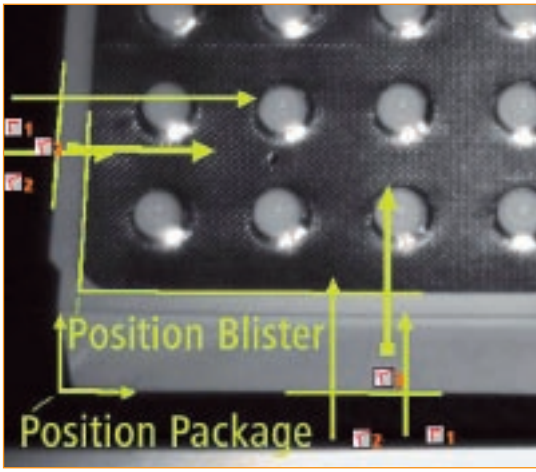


Fig. 3: With subsequent inspections within one single image, the task is accomplished with a single vision sensor

product or its surrounding. Each product's configuration and inspection parameters are stored within one of the 255 supported jobs, which are selected at run time via digital input.

Reflecting Blisters and Grey Cardboards

Inspection of package content within the package blank itself at high throughput is a typical application in the packaging industry. An important commercial requirement is low cost of ownership, secure investment and spare part availability from the shelf. Therefore a vision sensor basically has the most attractive potential.

In the current application, inspection for alignment of blisters subjected to aligned packaging inside cardboard boxes is required. The overall process throughput is about 600 pieces per minute. The different materials of cardboard blank, blister and conveyor show different optical behaviour. All metallic parts suffer from more or less intense reflections. Each material shows a different brightness, which varies due to natural shading of illumination over the scene. Due to the contour based approach of VeriSens, the challenging optical characteristics of the specimen are no limitation, if a high quality CCD image sensor of the VeriSens series 1000 is used.

Typical results are shown in figure 3. With subsequent inspections within one single image, the task is accomplished with a single vision sensor. For solution of the inspection, three horizontal and vertical positions are detected by VeriSens. First the reference edge on the left is estimated with two horizontal and vertical search arrows. Then the position and orientation of this reference edge with respect to the conveyor guidance is compared with its expected position via thresholds. In the last step the vision sensor checks the alignment of the blister with respect to the reference edge also via horizontal and vertical search arrows. The process tolerances are determined by the length of the arrows. Both results are combined and forwarded to the vision sensor's OK or Not-OK output which is sent to the PLC.

In case of new production settings, new reference values or thresholds for alignment tolerances may be adjusted via easy teach in. Different types of products, which require different features to be inspected, need different jobs.

And So Much More

For customer support and stable operation VeriSens provides powerful add-ons like storage of failure images, process statistics and documentation of test results. With VeriSens series 1200 all positions are also available as data sets via serial interface.

If more challenging environmental conditions are met, the vision sensors are also available in stainless steel with protection class up to IP 69 K.

Even increased performance is feasible. Already in its standard version, the product supports precise external triggering of external illumination devices. For example, if a user wants to check the presence of all pills inside the blister, the counting itself is supported by the VeriSens. Meeting the expected reliability in this case, requires a more sophisticated homogeneous illumination, which improves the overall appearance of objects and suppresses local artefacts.

The above examples show how powerful contour-based vision sensors perform. Today's vision sensor technology is highly suitable for inspection tasks which are not simply accessible with traditional optical sensors. With the contour based FEX technology of VeriSens new applications are solved in a robust and reliable way.

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Think Small!

Small Lenses Big Time

Ten years ago image processing systems cost 10K-20K USD and shoe box sized systems were considered small. Then the Industry „went sensor," with sizes and prices dropping by factors of 10. And the lenses?

Foto: Pixelio

To maintain compatibility, the camera lenses for sensor type systems were forced to undergo equivalent reductions in size. The resulting decrease in quality was accepted as being unavoidable. The bigger vision systems continued using the C-Mount standard for quality reasons. But now micro lenses are beginning to challenge this very standard. This article discusses some exciting small optical lens related developments and a few packaging applications that benefited from these advances.

The requests for small lenses was indeed tremendous, just to mention internet cameras and camera mobile phones. To get a nice market share the competitors optimized production cost. Once the prices hit rock bottom, an escape from the vicious circle was to increase the quality by investing in the very latest technology, in machines for diamond turning of aspherics to name it. This indeed separated the wheat from the chaff. A new high end market for small lenses arose.

Size (like a sugar cube) and Price (50–10 % of a C-Mount lens – depending on the volume and quality) were the big reasons to use the small lenses. However, it is their improved quality (up to 200lp/mm at 30 % contrast) what is now making them suitable for use in entirely new markets.

The following questions reveal some typical concerns and assumptions of those thinking about making the move to small, so called S-Mount, lenses. The accompanying answers show that most of these concerns are unjustified.

Can we get the same quality as with large lenses? These thingies are so small.

The newest objectives include 4–6 glass lenses in a sugar cube size. So, simplified, there are 8–12 surfaces to compensate for optical flaws. This packaging sets limits, but most C-Mount objectives feature fewer lenses. Consequently, even well known C-Mount brands could ultimately be replaced by S-Mount.

Can small lenses be fast (=light sensitive)? Aren't they too small for the light to pass?

The fastest C-Mount lenses of which we are aware of have an f-stop of 0.95. The best S-Mount lenses offer F1.2. The best S-Mount with a small footprint offers F1.4. You can compare the F stops 1:1.

What about distortion? I do stereo imaging and image unwarping per FPGA. Surely there aren't any low distortion S-Mounts?

Indeed there are. F = 4.3 mm lenses are available with 3 % TV distortion, F = 6 mm and above with much less than 1 % distortion.

Is not resolution a function of the size? I use a half inch 3 Megapixel Sensor. So I need a C-Mount lens.

Not necessarily. There are S-Mount lenses with a resolution of 200 lp/mm at 20–30 % contrast that are fine for use with a sensor up to 1/1.8". This is achieved with diamond turned aspherical lenses – unthinkable only a few years ago.

What about manual iris, vario lenses or very short lenses for handheld devices?

All available. There are manual iris S-Mounts, even auto iris versions and types that mechanically exchange filters. Total length from front lens to sensor goes down to 10 mm at less than 1 % distortion – well suited for hand helds.

Small Lenses in Use

The following three examples from the packaging industry illustrate the growing appeal, acceptance and use of small lenses.

Reverse Vending Machine

The German reverse vending system uses a logo that looks different in visible and infrared light: respective IR corrected lenses are needed (IR and VIS both focussed) to check for the logo in the reverse vending machine. Sedeco Vision Components uses superior Smart Camera technology in combination with IR corrected Megapixel S-Mount lenses to verify that labels are genuine at 60 bottles per minute powered by some 30

Reverse vending machine with Sedeco Vision Components (photo courtesy of Landré recycling systems)

Parcel identification by volume and code (photo courtesy of Insensiv)

High resolution code reading with standard lens (left) and HR lens 200 lp/mm@30 % (right) (pictures courtesy of TopSenso)

double exposures and image processings per second.

3D Scanners for Parcel Identification

Insensiv developed a laser triangulation based embedded vision system that even includes illumination (the 6 yellowish SMT parts in the picture). The 3D scanner is used to determine the volume of parcels and to read characters (OCR) and codes. The restrictions for the lens were clearly size and the needed high resolution. To avoid reflections, the lens touches the IP65 cover of the housing.

High-Speed, High-Resolution Code Reading

Topsenso specializes in high-speed code reading (Barcodes, PDF417, ECC200 Data Matrix and others). The crucial point in these applications is perfect image resolution, simply to be able to read more detailed codes than the competition – even at speeds of 60 codes per second. A second point in this application is depth of field which is achieved by a custom designed F5.6 lens. Cameras, lenses and illumination are also available as remote head version – easily integrated into even small existing machines. For this special use of wide angle S-Mounts (60 degrees) at distortions as low as 3 % is made (typical lens distortions at such angles would reach 20 % and more).

More about these projects:
www.sedeco.nl
www.landre-recycling.nl
www.insensiv.de
www.topsenso.de

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Foto: Pixelio

Complexity Made Easy

Vision Sensors – the Uncomplicated Entry into Industrial Vision

Industrial vision is used where conventional sensors are not adequate for complex situations. This is, for example, the case if complex features like the control strip on packages or the presence of an expiry date in the destined area of the package has to be detected. With the Vision Sensor series VOS300 Pepperl+Fuchs extends its application range for industrial vision using configurable vision sensors. They provide the user with greater freedom of design without the need for programming knowledge and can, therefore, be adapted to a multitude of applications.

For users of conventional sensor technology the ideal industrial vision system is one which behaves as simple as a conventional sensor, e.g. a photoelectric switch, with regard to installation, connection and operation. The additional involvement of the system integrator who enables the solution in the client application by modifying and supplementing the supplied hardware and software components is not desirable.

Vision Sensors

This demand could recently be met by the introduction of vision sensors on the market as a third category beside the hitherto common classic industrial vision systems on PC basis and compact smart cameras.

Vision sensors are complex industrial vision systems which are already customized at factory for an application or area of application by the combination of attuned hardware and software components. This category of devices is characterized by an intentional ease of installation and operation without programming requirement. Industrial vision technology makes vision sensors much more powerful and flexible than conventional sensors, e.g. light barriers, on the one hand. On the other hand they are designed clearly simpler due to being customized for an area of application, making them cheaper than classic industrial vision systems.

Typical tasks for vision sensors are e.g. checking for the presence of objects or patterns, position detection for alignment purposes, or the detection of specific shapes. A very frequent application in the packaging industry is the check for presence of labels or imprintings, followed by positioning tasks.

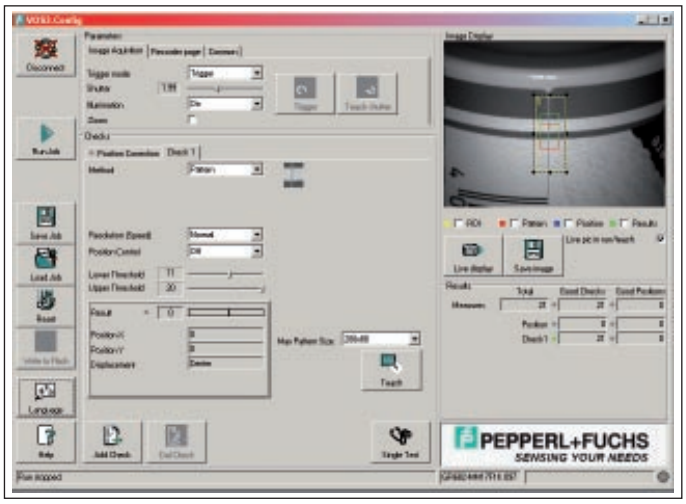
High Degree of Freedom

The vision sensors of Pepperl+Fuchs solve various tasks e.g. rack fine positioning of automatic stacker cranes in high bay warehouses or the detection of fault markings on sheet metal in car manufacture. Tasks for vision sensors are also found in packaging machines and in the graphical industry. Many of the vision sensors tailored to the requirements of these industries are usually deployed in larger quantities.

In addition, there is a large number of applications for vision sensors with a lower quantity potential, usually only requiring minor software adjustments. Smart cameras are not an efficient solution here due to the high integration costs required. For the optimum functionality in such applications the vision sensor must be user-configurable within certain limits, but should not require deeper specialized image processing knowledge for configuration.

For the most varied applications even in smaller quantities Pepperl+Fuchs provides the configurable vision sensors of series VOS300. They offer the customer a higher degree of freedom in application through different typical evaluation methods within a single device. This enables users to select the detection algorithm suited for the detection task and modify a few

The vision sensor VOS310 provides powerful and fast object detection in a compact industrial housing



The user interface permits the intuitive configuration of the vision sensor– here shown with label control in a packaging machine for yoghurt cups

parameters directly or via the teach-in function.

Five Different Feature Checks

The vision sensor VOS310 allows up to five different checks for features in an image, e.g. for presence, completeness, position or angle of rotation. The checks can be logically linked to each other to allow e.g. the detection of the complete presence of several details in an assembly.

For less complex checks there is the variant VOS301 with only a single check.

As evaluation methods for each check the algorithms gray value, contrast, gradient, pattern, and contour are available, and their specific parameters can be adapted to the concrete application. Pattern and contour enable to find – after teach-in – distinct well known features like logos, graphics or shapes. The other group of methods with grey value, contrast and gradient is able to check the presence of features with unknown or changing content, e.g. manufacturing dates or batch numbers, without to read the text content.

After being configured via Ethernet using the VOS3-Config software the vision sensors works without a PC during automatic operation.

Ideal for Industrial Environments

The image resolution of 640 x 480 pixels and the high sensitivity permit powerful object detection even for fast moving objects, e.g. those common in the packaging industry.

With an IP65 aluminium housing and external focus from the back of the housing without opening the device, these vision sensors are ideal for industrial environments. The integrated white LED illumination is perfectly suited for working distances up to approx. 100 mm and can be supported by various external light sources.

The Ethernet connection for configuration is accessible via common industrial M12 connectors as are the digital inputs and outputs and the RS 422 interface for the transfer of process data, e.g. position and angle of rotation.

The mounting accessories included in the scope of delivery facilitate the rapid installation within the application.

Industry Experience Transferred to Software

Especially in the software – both in the camera and in the user interface – Pepperl+Fuchs has made consistent use of its market experience in the packaging industry:

For the reliable detection of structured objects; e.g. tax marks or imprinted text like date codes, the gradient evaluation method is used. Position correction permits the subsequent correction of search areas, e.g. based on object edges, and can also be used as a strong independent evaluation method for positioning tasks.

The user interface was purposefully designed to be clear and logical. Large buttons encourage touch screen operation. Sensible default values reduce the risk of incorrect settings. The user interface can be started in setup and operating mode: Similar to the administrator of a PC, the installer can configure an application completely, whereas the operator may only open and execute these stored test jobs.

Offline simulation, allowing for the identical evaluation of captured images without a camera connected, has also become a formidable tool. It permits the analysis of error characteristics and adaptation of test parameters. Because neither object nor camera needs to be present, the simulation mode is ideally suited for rapid and uncomplicated remote diagnosis and consultation.

With the Vision Sensor series VOS300 Pepperl+Fuchs extends their product range for industrial vision with configurable vision sensors. The high flexibility of these devices and the uncomplicated entry into this technology deserve particular attention. They enable the solution of additional sensor technology tasks via industrial vision for a wide range of users.

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Capture and Display Board for Medical Imaging

Matrox Vio-Analog is the newest member of the Matrox Vio family of boards for video capture and display. They deliver superior quality and definition of state-of-the-art broadcast video to simulation, training and medical imaging markets. For the simulation and training markets in particular, the Matrox Vio Analog offers a cost effective solution for high-resolution display. Visible light modalities in medical imaging are able to push beyond traditional NTSC/PAL and take advantage of leading edge high-definition video technology. It is a single platform capture card that supports analog HD/SD input and output. Some of its key features include low-latency video output (synchronized to the video input), 128-bit MB on-board memory, support for 20-bit video, automatic detection of the video source, and graphics overlay composition.

Rauscher
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Miniature Camera Module

Three grams is all the new Videor Technical's Sentech STC-DP64 miniature camera registers on the scales, but this does not stop if from delivering clear and sharp pictures in full PAL resolution. This camera was developed especially for special applications where space is limited. The camera comprises a 1/4" CCD sensor with a resolution of 720 x 576 pixels. A 65 mm flexible PCB track connects the image sensor with the 48 x 10mm board. A lens and lens connector are not provided as the camera is designed for installation in devices and systems fitted with a lens mount. The flexible PCB track can be bent at any position to allow easy integration into devices in which a straight track is unsuitable or the CCD sensor orientation makes it impossible. The CCD sensor orientation also allows a mirror function selectable through communication. A voltage between 5 and 11 VDC supplies the camera which delivers an analogue PAL video signal.

Videor Technical E. Hartig GmbH
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New Version of Graphical FPGA Programming Tool

With the current version 1.2, the graphical FPGA programming tool VisualApplets enhances its functionality for about 100 new operators. Focuses of the new version are extensions of the graphic user interface and the functional libraries. Users with an extensive use of complex image processing designs are supported by an updated interface for the design space and the project administration. The existing libraries were extended by new functions. Especially operators for image corrections and enhancements, new synchronisation and filter operators were added. As a focus of version 1.2, two new image processing libraries were implemented. The first library covers operators for the statistic processing of images and can be used e.g. for measuring applications with 3D laser triangulation method. The second library covers signal processing operators.

Silicon Software GmbH
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New High Sensitivity Imaging Sensors

e2v announced a new generation of high-sensitivity imaging sensors leveraging circuit layer transfer technology from Tracit Technologies, a new division of the Soitec Group. Combining e2v's expertise with Tracit's circuit layer transfer technology delivers back-illumination capability to medium volume markets for the first time. This technology produces a dramatic improvement in sensor sensitivity when compared to a standard front-illuminated sensor. This makes the new sensor an ideal solution for a broad range of applications, especially in medium volume, professional imaging sensor markets. It also complements the company's existing back-illumination capability for low-volume markets like aerospace and life sciences.

e2v • Tel.: +33/4/765830-00 • enquiries@e2v.com • www.e2v.com

Interlaced Goes Digital

An important reason why most industrial image processing systems still use analog interfaces is that almost every second application employs interlaced sensors that were until now only available with analog cameras. With new interlaced Guppy camera models, Allied Vision Technologies now forges a link between interlaced technology and digital FireWire interface and makes the transition from analog to digital simpler than ever before. The new cameras are equipped with the same interlaced sensors as the majority of analog systems. So the migration to a digital interface can be performed without any changes to other system components such as sensors, lenses and software. With the new Guppy, users no longer have to choose between the respective advantages of analog and digital technologies.

Allied Vision Technologies GmbH
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Line Scan Cameras

e2v offers a complete spectrum of line scan cameras for all image-processing applications: monochrome and colour with resolutions from 512 to 12,288 pixel/line and line rates up to 109 kHz. Data interfaces are usually freely selectable: LVDS, Camera Link and GigE Vision. All cameras have a highly compact housing with flexible assembly options, and are supplied with the interactive configuration program CommCam. UK-based e2v took over the ATMEL plant in Grenoble in 2006. Both production and development of innovative products continue under the management of the experienced sensor, camera and software specialists.

Rauscher • Tel.: +49/8142/44841-0 • info@rauscher.de • www.rauscher.de

3D Machine Vision

Scorpion Vision Software 6.0 from Tordivel has been completed with extensive 3D support. The most advanced 2D and 3D solutions are made without any kind of programming. The 3D module of Scorpion 6.0 has more than 30 new point & click tools to support 3D Camera Calibration, 3D Stereo Vision, 3D Laser Profiling and true 3D Point Cloud Processing, Analysis and Manipulation. Everything is visualized with the integrated and complete set of 3D visualization features. The Vision Software is the perfect companion to Sony SmartCameras, digital cameras with USB, Firewire and GigE interfaces and 3D Image Sensors. It is an independent and open software tool for industrial vision.

Tordivel AS
Tel.: +47/2315/8700 • office@tordivel.com • www.scorpionvision.com

Easy Vision Sensor

The 48 MS MultiSight from Rockwell Automation is a fully self-contained, multi-function vision sensor, which can handle up to ten different inspections simultaneously and pass a simple OK/Not OK signal to an external PLC or process controller. Incorporating camera, optic, lighting, communications and fail/pass controller in one package saves a great deal of installation time and hardware cost, significantly reducing the total cost of ownership. The new vision sensor features a high-resolution 640 x 480 pixel CCD element with optics, and employs three different inspection tools – pattern matching, contrast and brightness. Advanced models with contour detection and XY position control will also be available very soon. In combination, these capabilities allow the 48 MS to perform up to ten different inspections simultaneously including logic operations.

Rockwell Automation
Tel.: +32/26630600 • www.rockwellautomation.com

16 Megapixel GigE-Vision CCD Camera

The 16-megapixel Prosilica GE4900 is a very high-resolution CCD camera with Gigabit Ethernet output. The 35 mm format sensor used in the GE4900 is the high-quality Kodak KAI-16000 CCD image sensor that provides exceptionally high resolution and good sensitivity. The GigE Vision compliant GE4900 works with standard Gigabit Ethernet hardware and cable lengths up to 100 meters (300 ft) using conventional Cat-5e network cable. Applications for the Prosilica GE4900 include LCD panel inspection, semiconductor wafer inspection, solar panel inspection, high-resolution industrial inspection, aerial photography, 3D metrology, general machine vision, medical imaging, public security, surveillance, traffic imaging (Intelligent Traffic Systems), embedded systems, and OEM applications.

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New Lens Series for 1/1,8" Megapixel Chips

In summer 2007 Tamron launched a new Machine Vision lens series for 1/1.8 Mega Pixel capable sensors. These lenses offer uniformly high resolution and high contrast from the center of the image to the edges. Particularly noteworthy is the fact that the design has taken close range imagery into consideration, thereby avoiding performance drop-off at the commonly used extreme close range, to ensure high image quality. In addition to its goal of achieving higher image quality, Tamron has also succeeded in making these lenses more compact. By reducing the minimum focus distance, these lenses offer a broader shooting range. With the new lenses, imaging for most applications can be achieved without attaching a close-up extension ring. The minimum focus distance for the 16 mm lens has been reduced from 0.3 – 0.1 m.

Tamron Europe GmbH
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New Camera Models in Production

Basler's pioneer series entered series production in May 2007 with the first series production batches for the majority of models in that family. After a zero-series phase and some optimizations in the camera design the cameras have accomplished key customer tests. The pioneer family consists of 10 camera models from VGA to 5 megapixels in resolution and up to 210 frames per second in speed. They are equipped with Kodak or Sony CCD image sensors to ensure the best mixture of speed, resolution and a very attractive price. All cameras feature the robust and easy to use GigE Vision compliant interface that has proven its industrial reliability in the successful scout series.

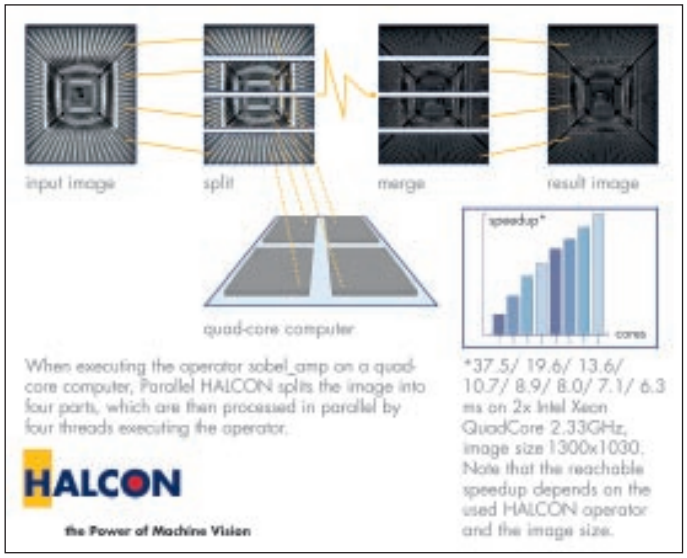
Basler AG
Tel.: +49/4102/463-500 • vc.sales.europe@baslerweb.com • www.basler-vc.com.

Princeton Instruments Acquires MegaPlus

Princeton Instruments has acquired the MegaPlus, high resolution camera, product line from Redlake MASD. Future developments in high resolution camera technology will benefit from the company's vast experience in fully integrated, low noise cameras solutions. The MegaPlus move will also compliment Princeton Instruments' range of OEM solutions. While Redlake's MegaPlus personnel will be joining the Princeton Instrument's team in New Jersey and at locations world-wide additional positions in engineering and technical support have also been created to ensure anticipated growth for the new organization's portfolio of camera and instrument solutions are met. The new organization will trade under the world renowned name of Princeton Instruments while retaining the now famous product brand names of Acton Spectrographs, Acton Optics and MegaPlus.

Princeton Instruments
Tel.: +1/609/587-9797 • moreinfo@piacton.com • www.piacton.com

Quad-Core Technology Speeds Up Machine Vision



The new generation of quad-core processors opens a new round of CPU architecture. They again drastically increase data throughput, provided that the software can make use of this luxury. Halcon 8.0, MVTec's new version of the leading machine vision software library, is already able to automatically use quad-core parallelization for a dramatically increased performance. This new version has been especially optimized for an improved speed-up by the automatic parallelization of image data. With regard to performance, this automatic parallelization by far can keep up with manual multi-threading. Even experts cannot manually implement parallelization much faster, which makes the automatic parallelization a good choice for every case.

MVTec Software GmbH
Tel.: +49/89/457695-0 • info@mvtec.com • www.mvtec.com

3D Object Recognition with only one Camera

From now on bin picking is possible without any greater effort. Hence, the software library for machine vision Halcon 8.0 by MVTec enables the identification of arbitrarily orientated objects as a standard technology ("3rd Generation Matching"). Up to now, Halcon's powerful shape-based matching already allowed the fast, reliable, and robust identification of 2D objects. With the new version 8.0, this also applies for 3D objects in arbitrary 3D positions and orientations. For this purpose, only a CAD model of the object has to be imported and trained. For this, the software library was extended to support the industrial standard to read DXF files. During the training of the CAD model, it computes the two-dimensional projections of the possible 3D poses of the object onto the image. Therefore, the imaging system needs only one camera.

MVTec Software GmbH • Tel.: +49/89/457695-0
info@mvtec.com • www.mvtec.com • www.halcon.com

Four New CCD Cameras

JAI announced the release of four new digital progressive scan CCD cameras: CM-140 MCL, CB-140 MCL, CM-200 MCL and CB-200 MCL. The cameras are digital Mini Camera Link (Mini-CL) versions of the popular analog CV-A1 and CV-A2 cameras, used worldwide in machine vision applications and other demanding applications where vision technology is an integrated part of a product, process or service. By implementing the Mini-CL interface standard, the camera housing is kept at the same compact 29(h) x 44(w) x 66(l) mm size as the CV-A1 and CV-A2 analog cameras. With a 1.45 megapixel resolution (1/2" SXGA), the CM-140 MCL/CB-140 MCL cameras operate at a maximum 31 frames/second, while the CM-200 MCL/CB-200 MCL have a 2 megapixel resolution (1/1.8" UXGA) and operate at a maximum 25 frames/second.

JAI A/S
Tel.: +45/4457/8888 • camerasales.emea@jai.com • www.jai.com

Camera Series with Enormous Variety

Every OEM user can select exactly what he needs from the extensive range of Leutron Vision's PicSight digital camera series. The completely new camera concept developed by the Swiss company provides the user with a high degree of flexibility and economic efficiency. The modular nature of the PicSight series enables cameras to be tailored to suit the user's individual requirements and to be supplied at very short notice. A variety of sensors, interfaces and processor modules can all be combined with each other to generate a range of 300 different types of camera. This means that the application engineer has a selection of 28 different types of sensors available to him, whether CCD monochrome or colour, ranging from VGA resolution up to 1,628 x 1,236 (UXGA) pixels, or CMOS with resolutions of more than 5 million pixels. And digital interfaces such as Gigabit-Ethernet, Camera Link and USB 2.0 are all available for data transfer.

Leutron Vision GmbH
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Windows Vista Compatible Software Driver

The new software driver version 2.40 for the uEye cameras from IDS now supports the latest Microsoft operating system (32-bit). Also included in the release is a range of new added functionality. The most interesting new feature is the possibility of flash exposure in free-run mode. This function was previously only available in trigger mode. In free-run mode the camera sensor works autonomously and at maximum speed. While one captured image is being transmitted, the next image is exposed. This provides very high frame rates. The short exposure times with flash support allow taking pin-sharp images even of quickly moving subjects. Permanent lighting is no longer required. The camera's flash output can also be used as a trigger signal, e.g. for starting external measurements. In that case the images are taken synchronously with the measurements.

IDS Imaging Development Systems GmbH • Tel.: +49/7134/96196-0
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New Microscope Camera

Jenoptik Laser, Optik, Systeme presents a new Microscope Camera with CMOS Sensor Technology. The ProgRes CT3 ranges at the same high proficiency level as other models of the family – combined with attractive acquisition costs. Providing a resolution of up to 3 megapixel and a subtle color differentiation, the ProgRes CT3 captures excellent digital images, especially when contrast methods with high light intensities are applied. The integrated CMOS sensor is absolutely resistant against blooming and shows superior performance in imaging highlights. The digital microscope camera allows for quick and precise setting of specimen and microscope, and hence provides comfortable operation. Configured with standard interfaces such as C-Mount and IEEE1394 Firewire, the camera easily connects to any microscope and computer.

Jenoptik Laser, Optik, Systeme GmbH
Tel.: +49/3641/65-3963 • progres@jenoptik.com • www.progres-camera.com

Pre-Processing in Real-Time

Silicon Software releases with microEnable IV-Full x1 a frame grabber, which supports all CameraLink compatible cameras on the market. It was designed and optimized on the processing of huge amount of image data. A vision coprocessor was integrated to support a real-time image processing with VisualApplets, a graphical tool for FPGA programming. Interfaces were added to enhance the functionality of the frame grabber and guarantee a high scalability and flexibility. Additional add-on boards support the distribution of up to 10taps Full configuration camera signals up to 256 grabbers or PCs as well as the extension of the pre-processing capability by PixelPlant coprocessor boards.

Silicon Software GmbH
Tel.: +49621/789/507-0 • info@silicon-software.de • www.silicon-software.de

Automated Imaging Association (AIA) names Dana Whalls Managing Director

Donald A. Vincent, who has headed the Robotic Industries Association (RIA) since 1983 and was active in its founding in 1974, did retire on June 30, 2007. He is succeeded by Jeffrey A. Burnstein, who has served as the organization's number two executive for more than two decades.

Vincent has been instrumental in the trade association's growth from a start-up with limited staff and resources to North America's leading robotics association now representing more than 250 companies served by a staff of 13 full-time employees.

Jeff Burnstein, who joined RIA in 1984 and up until recently served as Vice President of Marketing and PR, did take over as Executive Vice President of RIA on July 1 and also did assume Vincent's responsibilities as Executive Vice President of the ATC. In addition to serving as Vice President of Marketing & PR for RIA, Burnstein has served as Executive Director of AIA since 1986, helping the association become the world's largest machine vision trade group.

The Automated Imaging Association (AIA), one of the world's leading trade groups for the machine vision and imaging industry, recently announced the promotion of Dana Whalls to Managing Director.

Ms. Whalls has over 18 years experience in marketing, business development and finance in metropolitan Detroit area advertising agencies including eight years at an agency specializing in manufacturing and technology clients. She has served as Marketing and Public Relations Manager for the AIA since 2004.

"In the three years Dana has been with AIA, she has played a pivotal role in our growth to more than 285 member companies in 26 nations. I'm certain she will do an outstanding job in leading AIA and the machine vision industry to great accomplishments in the years ahead,'' said Jeff Burnstein.

"I'm looking forward to continuing to work with the dynamic team Jeff Burnstein put together here at AIA and helping to grow the industry through increased awareness and use of this technology that touches all of our lives,'' said Whalls. "It is gratifying to be an advocate for such an exciting industry.''

Founded in 1984, AIA was organized specifically to promote the understanding and use of image capture and analysis technology and now represents more than 285 machine vision suppliers, system integrators, users, researchers, and consulting firms. AIA is best-known for The Vision Show and conference, held every year in the US, the biennial International Robots & Vision Show and conference (every two years in Chicago), its annual Machine Vision Market Study, the AIA Business Conference and Machine Vision Online (www.machinevisiononline.org).

AIA Automated Imaging Association
Phone: ++1/734/994-6088
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www.machinevisiononline.org

New GigE Vision Camera

Toshi Hori, an expert and visionary in the machine vision industry, forms new camera company that takes full advantage of the Gigabit Ethernet Technology. Gevicam, a start-up dedicated to providing GigE imaging solutions, announced the launch of its first GigE camera product line. Designed around a solid platform, the GP-series (GP-3360, GP-2360, GP-3780, GP-21400, GP-151400, etc.) will be the first lineup of cameras to be offered. In addition, Gevicam incorporates Pleora's unmatched GigE technology and SDK, enabling OEMs and end users to develop powerful, competitive applications.

Gevicam Inc.
Tel.: +1/408/368-1212 • info@gevicam.com • www.gevicam.com

Linescan Strengthens Presence

i2S Linescan is bolstering its presence on the American market by opening a new sales office in Orange, Connecticut for its subsidiary i2S Linescan Imaging Inc. Given the significant prospects for business development in the United States, the new office is part of a push to be close to the market so as to be better able to react to customer requirements and to increase business relationships in the United States, Canada and South America. "The choice of opening a new office and establishing a presence here is a new step in the development of our i2S Linescan division and is a response to increased surface inspection activity in the American market. Our presence on this continent is a strategic choice to have better communication and meet our customers' expectations", comments Alain Ricros, Chairman of the Supervisory Board of the i2S group.

i2S Linescan
Tel.: +33/557/266902 • info@i2s-linescan.com • www.i2s-linescan.com

PCI Express Board

A new Camera Link PCI Express frame grabber is now part of the Grablink series. The Grablink Express is at the cutting-edge of the Camera Link technology through the compliance with the Base-configuration of the new Camera Link standard 1.2. This revision includes Power over Camera Link –PoCL-. It allows a single Camera Link cable to supply power on top of transferring high-speed images and controlling the camera. The Grablink Express board acquires 24-bit images at 85 MHz. It offers simple and reliable line-scan acquisition and a full support of area-scan cameras. For system integration, the Grablink Express is equipped with nine various I/O lines available on an external and on an internal connector.

Euresys • Tel.: +32/4/367-7288 • info@euresys.com • www.euresys.com

Autofocus Camera Module

Videor Technical presents the new Sentech STC-AF56 autofocus camera module. Its 22x zoom lens covers an aperture range from 3.9 to 85.8 mm and directs its light onto a 1/6" CCD colour sensor. The camera can also be configured to deliver a CVBS or YC signal, though in NTSC as the camera output is optimised for 60 Hz VGA. A line doubler and scaler prepare the video signal so that the camera can be connected in progressive mode directly to a TFT display or a projector with VGA input. An RS-232 interface gives direct access to the digital signal processor upon which several hundred parameters can be set. Zoom, focus and all other special functions are operable over this interface using the available free PC software. Furthermore, the protocol is freely accessible so that user operating concepts can also be developed.

Videor Technical E. Hartig GmbH • Tel.: +49/6074/888-0
info@videortechnical.com • www.videortechnical.com

Dual Line Scan CCD Sensor

Dalsa Corporation announced its Spyder 3 CL line scan camera with Camera Link interface. The Spyder 3 surpasses its predecessor, the Spyder 2 with three times more responsivity and twice the speed, without impacting noise levels. The camera's responsivity is particularly important in low lighting situations. At its core, is Dalsa's latest dual line scan sensor technology which achieves unprecedented responsivity and throughput of 80 Mega pixels per second. The Spyder 3 CL can be used for many applications including glass edge inspection, general purpose web inspection, postal sorting, industrial metrology, pick and place applications and medical and scientific imaging. The line scan camera can accelerate applications with better image quality and higher throughput, boosting quality and efficiency.

Dalsa
Tel.: +1/514/333-1301 • sales.europe@dalsa.com • www.dalsa.com

FireWire and Gigabit Ethernet Cameras

Baumer extends its product range of digital matrix cameras by introducing several powerful new models. The new cameras are equipped with a 5 megapixel progressive scan CCD sensor and FireWire or Gigabit Ethernet interface. The camera design makes optimal use of the 5 megapixel monochrome CCD sensor in the cameras of the TX and F series. This new imaging sensor and the 12 bit signal processor are the basis for excellent image quality and performance. The new cameras are especially well suited for applications that require high frame rates in combination with high resolutions. In high-speed mode the cameras support up to 15 full frames/sec and can be used in many new industrial applications.

Baumer Optronic GmbH • Tel.: +49/3528/4386-0
sales@baumeroptronic.com • www.baumeroptronic.com

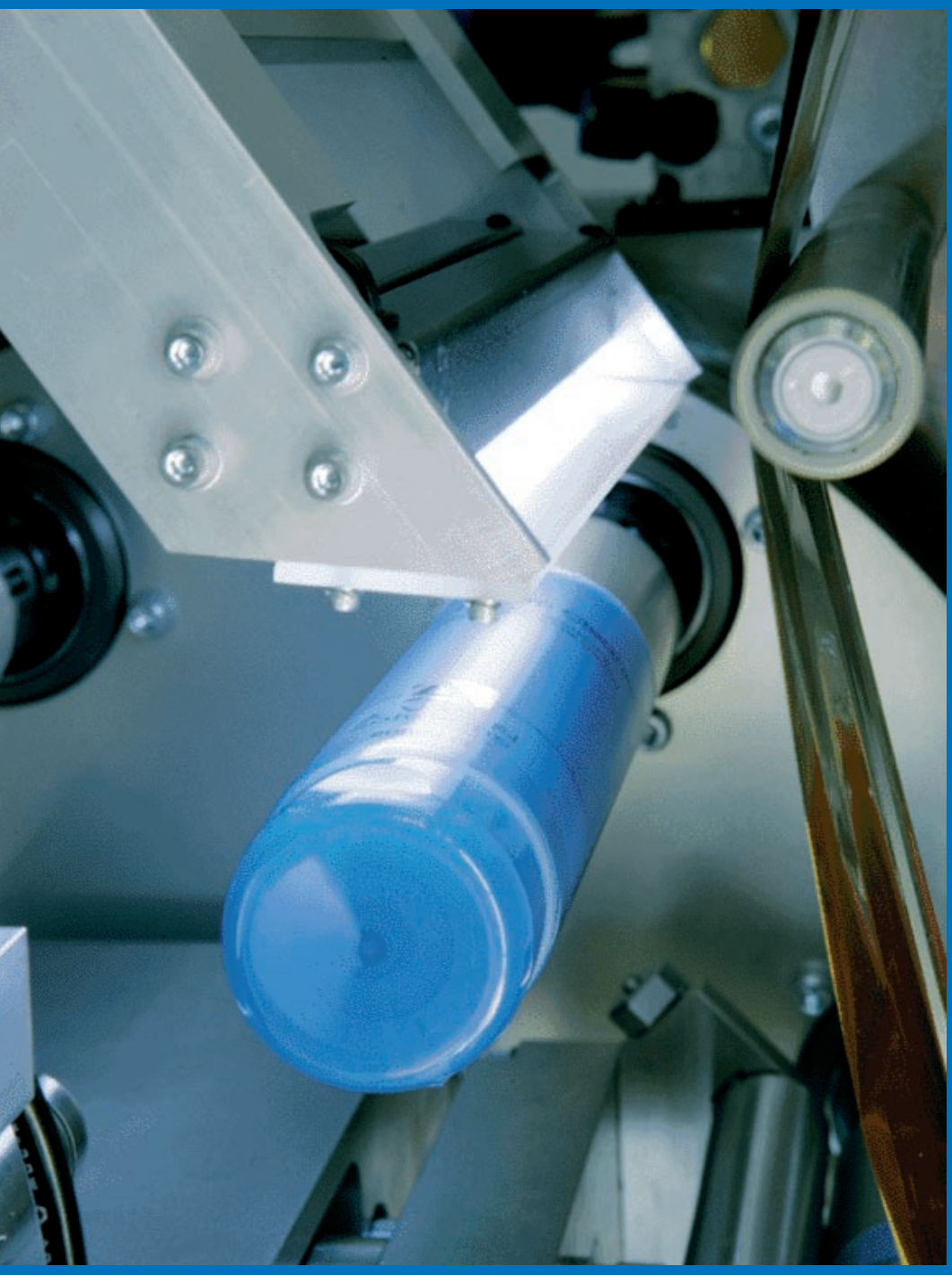
New Camera Family

Basler announces series production of the first members in the new sprint camera family. As a first step, the 4 k monochrome members will be moved to series production in Q 3 of 2007. The new Basler sprint family of line scan cameras includes members with 2 k, 4 k, and 8 k resolution and speeds from 19.3 – 140 kHz. The maximum line rate can be achieved with the 2 k and the 4 k members. All resolutions will be available in color in the near future. The sprint's unique dual line CMOS sensor was developed exclusively for Basler and enables an amazing line rate of 140 kHz at a resolution of 4 k pixels. Some other significant features of this sensor are the outstanding sensitivity and the excellent SNR (signal-to-noise ratio).

Basler AG • Tel.: +49/4102/463-500
vc.sales.europe@baslerweb.com • www.basler-vc.com

Flawless Countenance

Quality Control in Cosmetic Packaging



SIGNUM COMPUTER IN BRIEF

For 25 years now, Signum is a well-known technology partner for the machinery manufacturing as well as for end customers with special requirements to a machine vision system for quality control.

The machinery companies use the jointly developed innovations for their world-wide success in their particular market segment. Some outstanding examples are: inspection systems for plastic cards, curtain cloth cutting machines, hot foil stamping machines for tubes, and screen print machines for tubes and cartridges.

The end customers benefit from our long-lasting experience in the range of print control and surface inspection. With our systematic approach to complex applications including the pilot survey as well as the detailed specification and the on-site installation and start-up we help to ensure our customers' success. Signum provides the adequate solution – and not what is on-hand. In addition, we provide the on-site or remote maintenance of the systems so they can be in use for well over 10 years.

signum Computer

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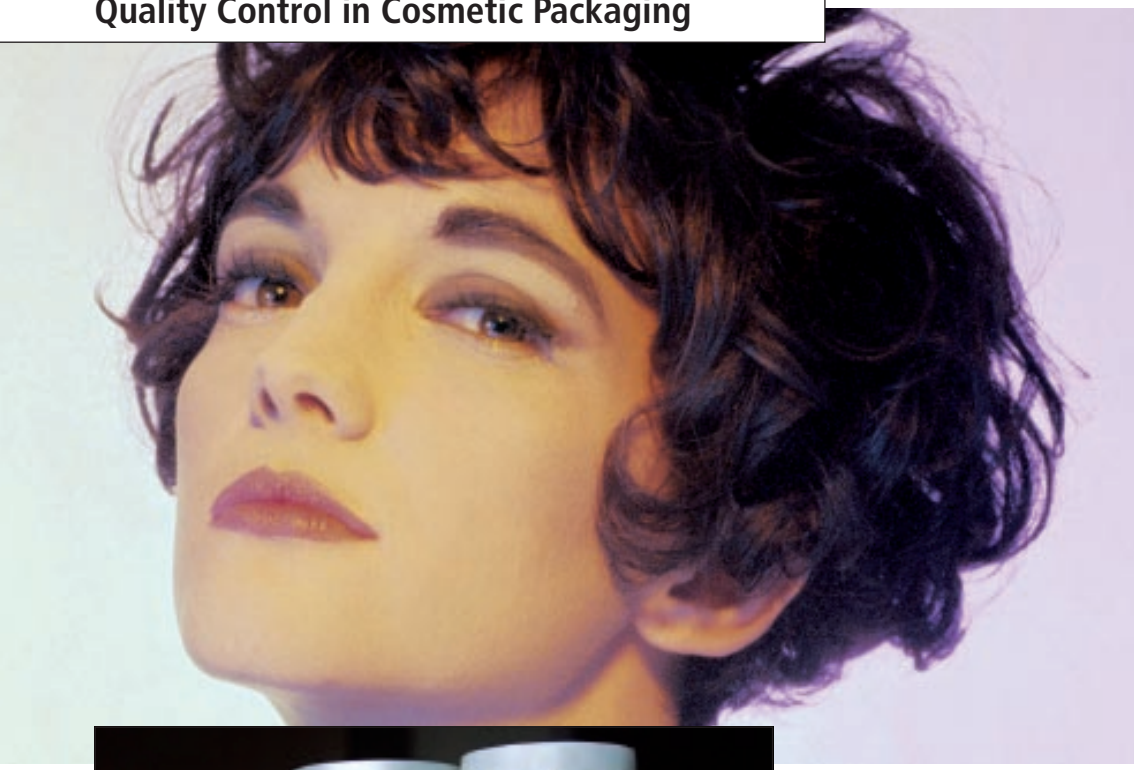
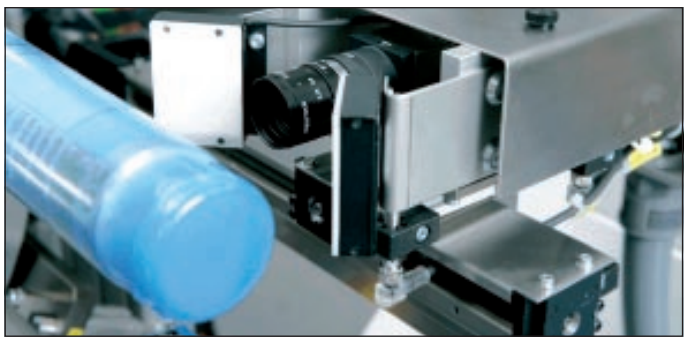
Flawless Countenance

Quality Control in Cosmetic Packaging



The turnover of the German cosmetics industry exceeds € 1.5 billion. All cosmetic products are supplied in a packaging – a box, a tube, a bottle, etc. -which is generally enhanced in a particularly appealing and exclusive way. Accordingly, the manufacturer of the packaging has to meet strict requirements for quality control. In this article you find a few examples for the various applications of quality control within the cosmetic packaging industry and it shows which advantages the manufacturer has by employing image processing systems.

Cosmetic packagings are generally enhanced in a particularly appealing and exclusive way



An array camera determines the exact radial and axial position using the tube's print image

Inspection of Hot Foil Stamping on Tubes

Cosmetic tubes are optically enhanced with gold and silver foil stamping which generally represents the brand name of the product. Therefore it is crucial to ensure the quality of the stamping. Apart from the correct positioning before printing, special attention has to be drawn to defects in the foil such as holes, break-offs and dull spots.

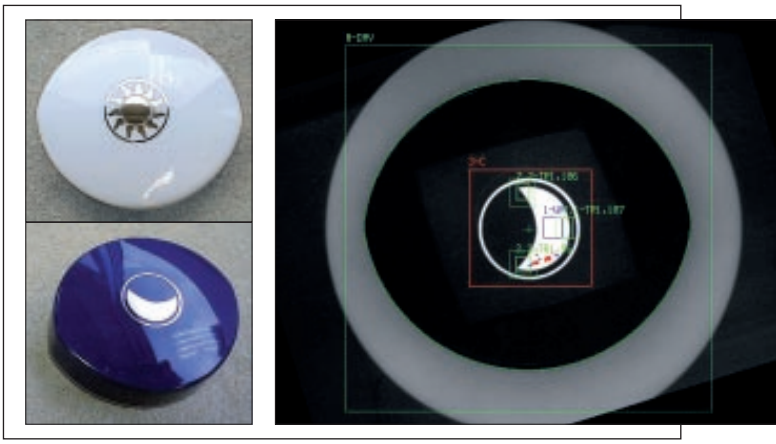
In close co-operation with Madag Printing Systems, the manufacturer of the stamping machines, Signum has developed a 100 % inspection system for this task. The machine is designed to perform 90 cycles per minute. The tubes are put onto mandrels on a turntable passing five stations. After the tubes have been placed, a registration mark sensor determines the approximate position at the second station. Subsequently, a surface camera determines the radial and axial position accurate to 0.01 mm using the tube's print image to compare the object position to the target position. The PLC corrects the position, so that in the stamping station the accurate position of the stamping in relation to the print is guaranteed.

Following the stamping, the tube is rotated under a line scan camera and the image of the circumference is compared to a reference image.

The illumination is selected in a way that the foil appears in reflection and therefore the background remains rather dark. Only in special cases the illumination is changed to dark field. Objects with a length of up to 200 mm can be inspected with a resolution of 0.1 mm/pixel. If required, the user can check also the imprint as well as the remaining surface for defects.

The innovative employment of image processing in the production machine enables the end customers to

Developed surface of the front of the tube with foil print and inspection windows



Lids of the day and night cream jars (left) and inspection result of a defective print (right)

produce and pack robot-aided and fully automatic. Delivering 40–50 machines with this new technology so far has made this manufacturer the market leader.

Control of Lid Ornaments with Hot Foil Stamping

The lids of cosmetic jars are particularly suitable for aesthetic and informative logos. For instance, the symbols sun and moon are stamped in gold foil for the day and the night cream jar.

This stamping must be inspected during the production process. The rotary position is arbitrary and the lateral position varies according to the width of the conveyor. Six stamping machines work with a number of cycles of 45/min each. At the discharge of each machine an inspection system is installed.

The lighting condition is optimized with a semi-permeable mirror in a way that despite the lens effect of the spheric surface an even illumination is ensured. The progressive scan camera triggered by a light sensor acquires an image and at first the position of the printing is determined and corrected. Subsequently, the area of interest is compared with a stored reference. The deviations are measured for their size (small marks blue, large marks red). The reject criteria are determined by the user in a parameterising process. The inspection system uses an air nozzle to reject.

The inspection systems have been in use with great success since 2002 at Weener Plastic Packaging Group. The machine operator can entirely focus on the productive capacity and can operate several machines simultaneously.

Inspection of Edges with Hot Foil Stamping

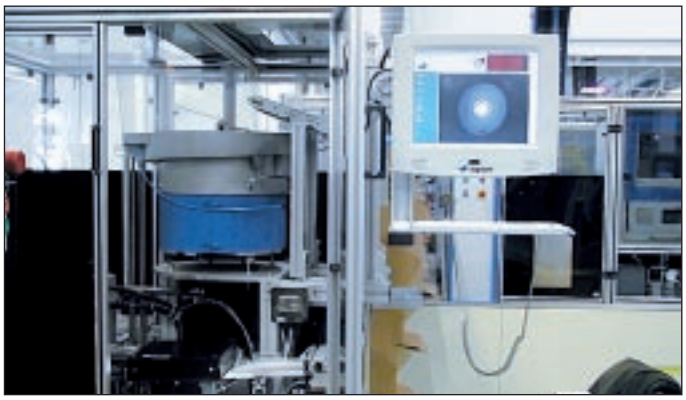
Caps and covers of cosmetic jars have frequently a hot foil stamping at the edges. The quality is to be inspected with image processing after the hot stamping process. Since the shape of these containers can vary from round to extremely oval, the image acquisition set-up has to be adapted to the different shapes as simple as possible.

The typical defects in hot stamping are:

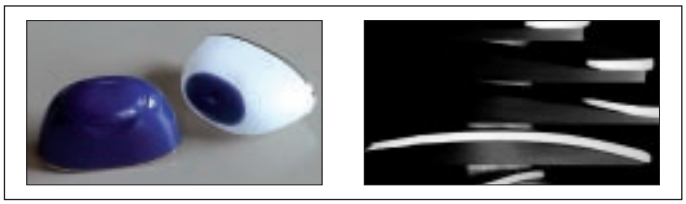
- marks
- holes, gaps
- outline error

The time for image acquisition and evaluation is typically 1 second.

In the example shown the contour is printed with a foil that is approx. 2 mm wide. Afterwards, the unit under test is put on a rotation device and is rotated 360 degrees. A progressive scan camera, which can be triggered asynchronously, takes 10 images while the object is



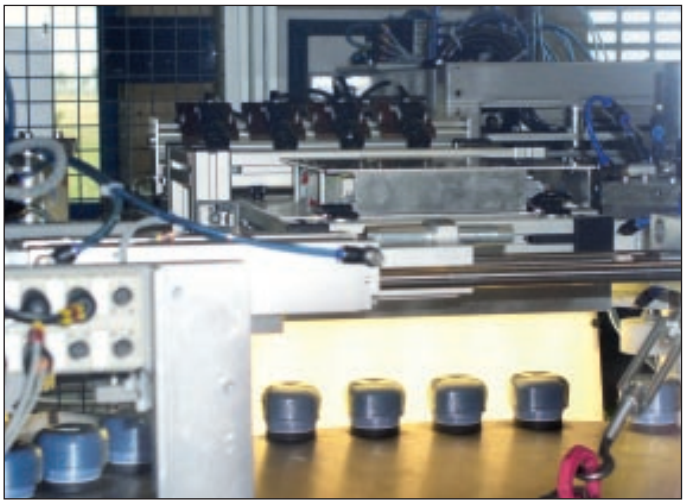
At the discharge of each machine an inspection system is installed



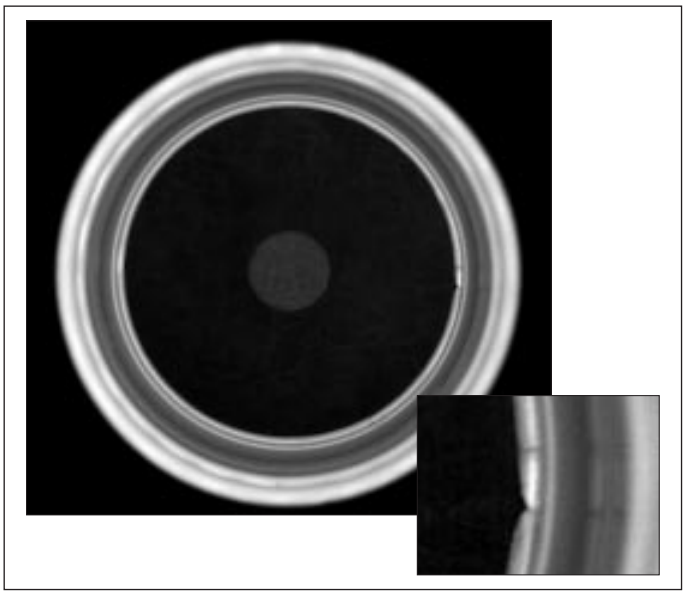
Oval Cap with hot foil print (left), image sequence of half a revolution (right), the second half is symmetric

25 Years of Signum Computer

In November 1982, Dr. Hayo Giebel established in co-operation with three colleagues Signum Computer for Signal Processing and Pattern Recognition. What was then pattern recognition became over the years today's industrial image processing / machine vision.
Apart from the field of interactive image processing with the product INCOS (some might recall this name), from the beginning also high-level projects for the industry were in the focus of the company's activities. Already in 1982 a 100 % inspection sytem for cigarettes was built with an efficiency of 7,500 pieces per minute. For this purpose VME bus computers with special hardware, high performance illumination and the line scan camera technology were developed.
In 1996, Signum was divided into Signum Bildtechnik GmbH (Managing Director: Dr. Hayo Giebel) with systems for television studios and crash test plants and Signum Computer GmbH (Managing Director: Dr. Alfred Vogel) with the focus on industrial print and surface inspection. Today, Signum Computer is the technology partner for machine builders who want to ensure their leading position in the international markets by integrating vision systems in their machines.



Position of the side wall inspection



Sealing ring for the roller ball (left), Image detail showing a defect with a depth of 0.25 mm (right)

rotated one full circle, so that the stamped edge can be completely examined. The lighting is arranged in a way that for each point of view a diffuse reflexion is created for the area to be inspected. Since the reflexion angle varies strongly due to the curvature of the object, the light source must be rather large and positioned close to the object.

In order to start the image acquisition at the correct time, a trigger device is fastened on the rotation axis. This trigger device has to be changed whenever a part with a different shape is produced. Depending on the shape of the product, the image sequence on the monitor looks different. For the extreme case of a round part all the images of a sequence look alike. The trigger distance of the rotation device may not be faster than 60 ms. Beyond that no demand is made against the uniformity of the rotation.

Since these caps are mass products, one of the customers operates eight of these stamping machines with inspection in 3 shifts 24 hours a day, another customer operates four of these machines. Now not only the manual offline inspection can be saved, but it is also possible to connect the machines to the final assembly.

Quality Control on Cosmetic Jars

Cosmetic plastic containers are to be inspected for moulding errors before they are packed. Typical defects are bubbles and inclusions, as well as break-offs during the assembly of the interior container.

On a top plate four containers are mounted in a row and inspected in the next cycle. The cycle time is approx. 4 seconds, 3 seconds of which is standstill time. In these 3 seconds all four jars are turned around once and eight images per revolution are acquired – altogether 32 images. The four progressive scan cameras are triggered by a light sensor arrangement. As soon as the group of four objects arrives in the next station for packing, the result has to be present and the grip arm rejects the bad parts. The sidewall inspection is supplemented by an inspection of the bottom of the containers, which is carried out on each jar on the conveyor before the final assembly.

Peter Gluth, project engineer at Weener Plastic Packaging Group: „Since the installation of this testing equipment and with a rejection rate less than 1 %, we have had no complaints by any customer."

Control of Sealing Rings for Roll-On Deodorants

The ball of a roll-on deodorant runs in a plastic ring to protect the bottle from leaking. On one hand, the sealing lip must ensure the passage for the deodorant liquid, on the other hand it has to fit evenly in order to prevent any leakage.

The sealing rings are moulded from one piece with the thin sealing lip. A small gap can remain opposite the injection point, if the material does not flow together correctly. This gap can cause a leakage. Therefore the sealing lip passes a 100 % inspection with a throughput of 100 pieces per minute before the assembly is carried out. The retaining rings are passed under a camera triggered asynchronously with 1,000 x 1,000 pixels and are illuminated with a ring light from above. An inductive sensor supplies a trigger signal when the ring is centrically positioned under the camera. The resolution of the image acquired is 0.05 mm/pixel. After the image acquisition, the exact position of the object is determined as well as the inner diameter of the sealing lip. Then the outline of the sealing rim is inspected. Parts with gaps exceeding a certain depth or size (which can be parameterised), are rejected as bad parts as well as rings with a large deviation from the target diameter. Bad parts are blown out with an air nozzle. A manual optical inspection would have required at least five people per shift to inspect this throughput with magnifying glasses.

The examples above show which benefits are brought to the manufacturers of cosmetic packaging by image processing. Due to strict requirements regarding the performance of the inspection system and the large variety of the packaging, the decision to work with Signum was made mainly because of Signum's creativity in providing solutions combined with the reliability of the systems installed.

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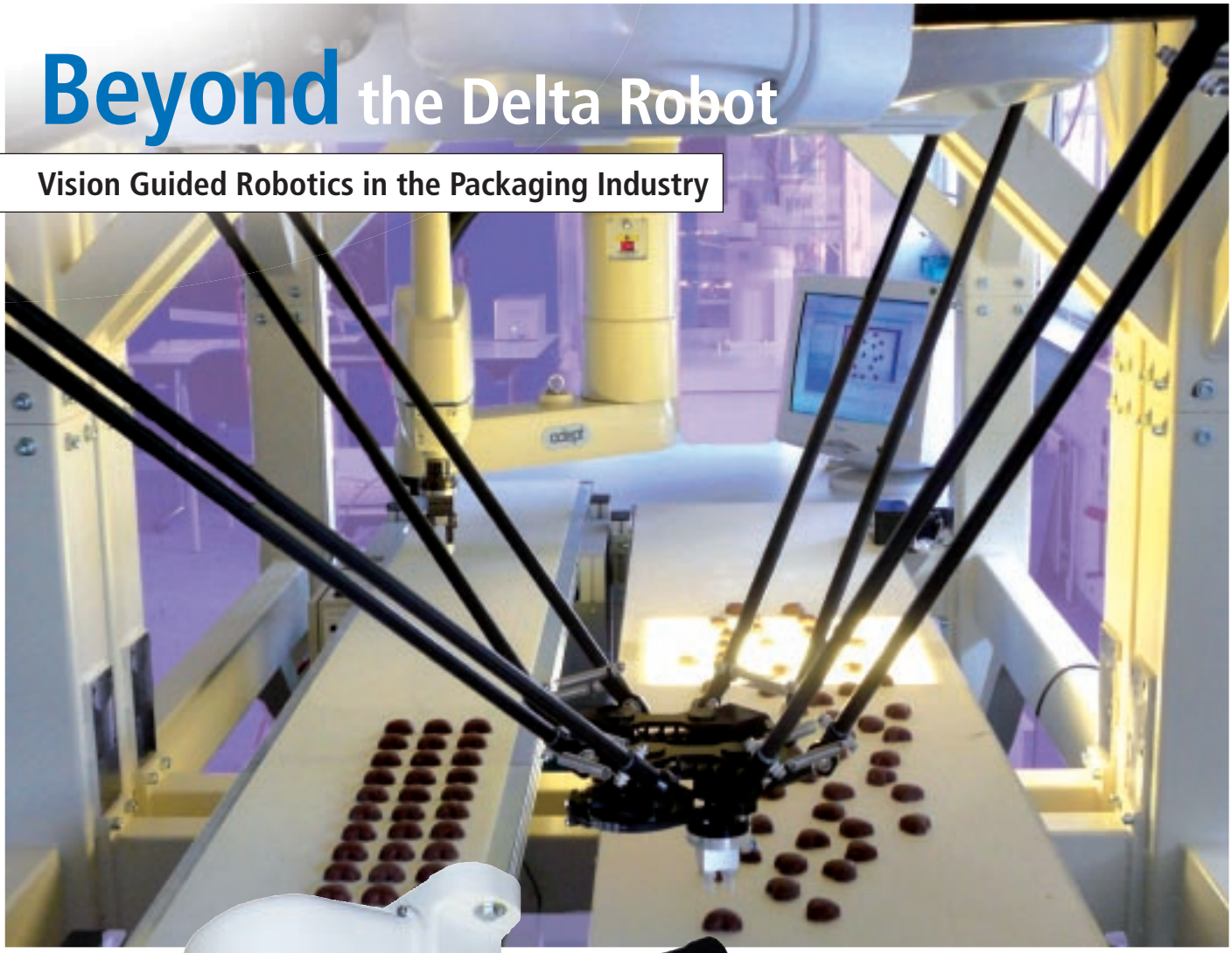
Beyond the Delta Robot

Vision Guided Robotics in the Packaging Industry



AdeptQuattro robot for high speed packaging

Since their introduction in the automotive industry in the 60s and 70s, robots have evolved into more intelligent, faster and cheaper tools over the last two decades. They can be used for a variety of tasks, making them ideal to tackle more demanding applications where they are required to 'see' and intelligently handle and reorient parts of any kinds. A market segment that benefits from theses developments is the packaging industry. The following article describes typical applications of vision guided robots for this industry.

Robots that 'See'

Typical vision guided packaging applications require the robot to sort out chaotic material flow. To accomplish this task the robot needs to have a look at the chaos and recognize the position and orientation of the products to be handled. This requires intelligent vision systems that are ideally tightly integrated into the robot's motion controller. Adept Technology has pioneered this vision/motion integration in the 80s. The robot with integrated vision uses either line scan or area cameras to recognize the products on a moving conveyor belt. It tracks the conveyor's position using a belt encoder. Given the position of the products on the conveyor belt that is determined by the vision system and the position of the belt in space, the robot at any time knows where the products are in space and

can accurately pick them up from the moving conveyor.

One of the key aspects to make the robots 'see' is an accurate object recognition. In the past simple blob recognition has been used to determine a product's position and orientation. This of course has drawbacks as it requires very deterministic lighting of the scene and makes it difficult to recognize touching parts. Therefore some pre-orientating and separation of the products was required.

Modern vision systems mostly use the concept of geometric object location which is based on a greyscale or colour image and uses distinct object features for recognition purposes. This makes the recognition process very independent from lighting changes and allows to recognize touching objects. An interesting side effect using vision to guide the robot is the possibility to inspect the incoming products and do online quality control. Using specific vision tools after product recognition, a pass/fail decision can be made and only products that meet certain criteria will be picked by the robot.

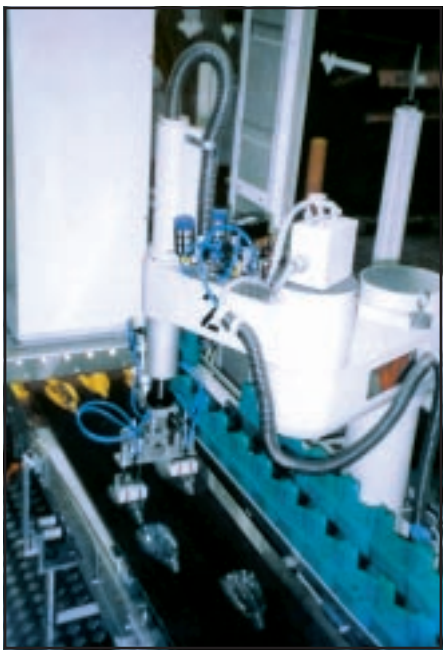
Motion/Vision Integration

Packaging applications can be very dynamic. Lots of installations require each robot to handle up to 120 products per minute with a complete packaging line providing capacity of let's say 1,000 products a minute. The raw products and finished packaging needs to flow through the line thus requiring high conveyor belt speeds. Quite often belt speeds of 20..30 m/min are required. Even applications with belt speeds of 60 m/min have been deployed. Image acquisition therefore needs to be tightly synchronised with the robot controller that tracks the position of the conveyor belt. The robot needs to know the exact position of the belt at the time the picture is taken by the camera. A jitter of only i.e. one millisecond during picture acquisition at 1m/s belt speed would result in a inaccuracy of 1mm. Typically the overall system accuracy needs to be in the range of 1..2m however, thus requiring synchronization latencies in the range of several µs to meet overall accuracy requirements.

As with any other vision guided robotics application the cameras need to be calibrated to the robot. In packaging applications, when picking from moving conveyor belts, the belts themselves also need to be calibrated to the robot. An integrated vision/motion solution provides calibration methods out of the box. This of course makes it straightforward for a machine builder to get a system deployed easily in a short timeframe.

AdeptSight Vision uses a geometric object locator for part recognition

Scara robots in a chocolate packaging line



Vision guided Scara robot doing bottle sorting

Typical Applications Examples

The technology described above can be applied to a wide range of applications in the packaging industry. Well known is the use of robots for chocolate or cookie packaging.

The picture on the next page shows Adept Scara robots in a chocolate packing application. This particular line has been installed around 1990 and is still in production. Typical throughput per robot is around 45 parts per minute. The chocolates are picked from an infeed belt where they arrive in a chaotic fashion. The vision system determines position and orientation, the robot picks the chocolate from the conveyor and places it into the blister on the main conveyor in the center. Flexibility is key as the chocolate manufacturer can run a range of different assortments on the same production line with just some software and gripper changes.

The same concept was applied to the following application: Shampoo bottles with different shapes and sizes needed to be fed into a bottle filling system. A dedicated feeder for each bottle type was not economic, the decision has been made to use vision guided robots to build a flexible feeding system. The empty bottles are fed on a conveyor belt, the vision system recognizes the position and orientation. In addition the vision system determines if the correct bottles are fed and picks only the correct ones from the belt. The bottles then are flipped 90 degrees and placed in a bucket chain in a vertical fashion. The properly oriented bottles are then fed into the filling station for further processing. Also here flexibility is a key element. A few software changes together with slight gripper modification allow to adapt the system to new bottle types.

Robot Kinematics

Historically general purpose Scara robots have been used frequently in packaging applications. Over the last years the development shifted towards the use of robots with kinematics that have been tailored specifically to high speed, low payload applications. Where general purpose Scara Robots are limited to a throughput of around 60..80 parts per minute when picking single products and placing them, parallel robot architectures are much better suited for light

payload applications. Delta Robots for example use three parallel arms to move a platform in XYZ and use a telescopic shaft to provide a theta rotation. These types of robots are able to handle around 120 parts per minute thus providing a more economic solution for high speed applications.

The most commonly known robot is the ABB Flexpicker. In addition, Bosch with its SIGpack Delta Robots provide parallel Robot solutions to the market. The concept of Delta Robots nowadays is very well established in the packaging industry.

For certain high speed applications several hundreds of the above mentioned Delta Robots have been deployed using Adept Technology's integrated motion and vision technology to benefit from the performance of the tight integration of the motion and vision system into one common controls architecture.

Latest Developments

To further boost throughput in high speed packaging and provide more economic solutions, Adept's latest developments led to a new type of robot kinematic. It is similar to a Delta Robot, but instead of using three parallel arms and a telescopic shaft, four parallel arms (therefore named Adept Quattro) are used to move an articulated platform in space.

The Quattro Robot – like the Delta – provides four degrees of freedom to move a part in XYZ and rotate around its theta axis. By using four parallel arms the performance of the Quattro is around 20% higher than a Delta Robot and therefore provides better economics in packaging lines where multiple robots are used. To further boost economics the motor amplifiers are completely integrated into the robot. This allows saving a significant amount of expensive floor space for the packaging line's controls cabinet as only the extremely compact robot controller needs to be mounted there.

Outlook

Further controls miniaturization is one of the most appealing areas of today's developments. The ultimate goal is to eliminate the external robot controller completely and integrate it – including the vision part of it – into to robot itself. In the end this leads to intelligent, networkable handling devices that allow easy integration and an extremely cost effective way of building intelligent packaging lines.

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Machine Vision in Middle-Earth

Inspection Systems for Food Packaging

There are many good reasons why the packaging of food needs to be of the highest quality. Satisfied customers with nothing to complain about might be the best one. To deliver the perfect product from the processing manufacturer right through onto the consumer's home table, it becomes crucial to guarantee an optimal packaging. Smart manufacturers rely on effective machine vision solutions to assure the best casing for their goods. Agriculture and food processing are still the predominating industries in New Zealand and therefore right in the focus of machine vision "Down Under". Lets have a look at some of the typical machine vision applications.

Web Extrusion

Inclusion of gels and carbon specs in clear plastic film can create an unfavourable reaction in the customer, when the plastic is surrounding food products. A comprehensive quality inspection system for extruded plastic film can be used to check for gels or other visual flaws. Ideally, these defects are recognised during the extrusion process before the film reaches the conversion machine. For

The fifth generation of smart cameras by Camsensor is the core of every Q: range system with the Camconsole providing detailed graphical information of production data

Expertise in Food Packaging

The New Zealand based company Camsensor develops and manufactures smart camera based turnkey inspection systems. A decade of machine vision experience has leveraged the company's systems over a broad range of industries, yet the food processing driven market found "Down Under" has been the main focus of Camsensor.
Camsensor's Q: range systems typically consist of a smart camera, the Camsensor 5, a specific lighting solution, the inspection operator interface Camconsole and the optional Camlink management database and web reporting.
The Camsensor smart cameras have been developed for the harshest industrial environments meeting the high hygiene standards of the food industry. The IP67 rating and solid 316 stainless steel housing ensures a long term and robust solution which can be hosed down. The sturdy housing incorporates all image processing components, including a fast, high resolution CMOS sensor, a powerful processor with USB and Ethernet interface. All smart cameras have multiple fast inputs and outputs for complex triggering mechanisms and reject or PLC interface.

manufacturers of continuous plastic film it is of importance to know exactly how the machinery is performing. Having a detailed production feedback improves the extrusion process and pinpoints machine faults at an early stage.

The Camsensor Q:Grade system inspects the film looking for changes of intensity. Once a black carbon spec is detected its size is measured. The accumulated results of all measured black specs determine the grade of the particular production run. The system provides different means to visualise the quality of different plastic film rolls. Either the exact position of the flaws on the film is displayed or a detailed overview of the whole roll is given. Whether printing an eyemark with an ink jet printer, applying a label or linking it to a database, the outcome will help to manage subsequent process. It provides reliable knowledge about the actual quality of the film and enhances the performance of the machinery. Production faults can be tracked easily and therefore be avoided.

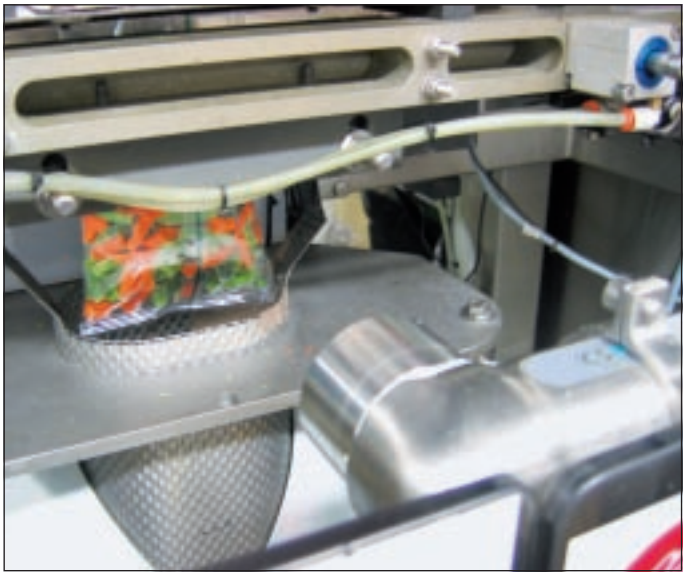
The linear sensor used in this application has a resolution of 2,048 pixels. It scans at 15 kHz, which is ideal for continuous scanning of a fast moving product. For example, over a 300mm film it will achieve ± 0.15mm resolution. That means that even very tiny gels and flaws will be detected. The Q:Grade system for web extrusion inspects reliably at speed lines as high as 90 m/min.

Plastic Bag Conversion

The same system can also be integrated onto a conversion machine, manufacturing plastic bags for food packaging. The bags can be graded and rejected if there is any unacceptable flaw. To check the quality of the bags by an operator would be inconsistent due to very high line speeds and minimal sizes of flaws. The system grades the bags (for example standard, second grade and scrap) counting the size and number of flaws and interfacing with a sorting unit. A tacho signal is used to track the flaws from the inspection position to the end of the conversion machine. Multiple outputs of the system are available, for example to disable a label applicator for saving on labels, and allowing the bag to be recycled.

The software of the system includes edge-tracking features. This takes into consideration the movement of the web on the rollers, allowing the smart camera to more accurately detect gels right up to the edge of the film and near gussets. This can im-

Food residue in the seal area causes major issues and makes this food package a complete waste product



The smart camera of the Q:Grade system inspects both the top and the bottom seal as the package is processed in the vertical flow wrap machine

The bagging equipment presents the optimized packaging for the measured and identified meat cut

prove the dead-band at the edges by approximately 50%. Additional adaptive thresholding functionality allows for the highest sensitivity possible in the detection of the flaws.

Meat Cut Identification

An additional dimension is required for meat cut identification and optimisation of the packaging for meat products. Using machine vision can dramatically reduce the amount of raw packaging material and lead to packing the goods efficiently for a better handling.

Standard camera imaging is 2-dimensional. By using a laser triangulation technique to create a 3D profile of a product it is possible to gather the relevant information about the meat cut to identify it through its volume and shape. The Q:Profile system uses an area sensor and a line laser. The first scan determines the metrics of the height and width of the product. By taking consecutive scans as the product moves past the inspection system the smart camera determines the length, the shape characteristics and the volume of the meat cut.

The output of the smart camera communicates via serial, Ethernet, DeviceNet or Modbus to the bagging equipment and automatically provides the correct packaging size and identification code for that particular meat product.

Flow Wrap

To ensure the highest quality standard in terms of freshness and storage life, the accuracy of a proper sealed food package is of paramount importance. Vacuumed food bags do not allow the tiniest leak to guarantee the quality of the product. Holes in the seal eventually lead to deterioration. The human eye can detect major leaks but it is impossible to determine micro leaks without a very close inspection. The accuracy and consistency of a modern machine vision system is therefore worth consideration.

The Q:Seal Flow Wrap system checks the seal integrity of a food bag packed on a vertical flow wrap machine. The implementation of such a system prevents mouldy food due to food residue or grease in the seal, burned or missing seals or folding of plastic in the seal.

By positioning a infrared LED backlight close to the seal bar, the system captures the seal areas as it falls through the flow wrap machine. An instantaneous reject signal for failed seals is provided at an inspection rate of more than 90 food bags per minute. The parameters for different products are adjustable, one system on a single flow wrap machine can inspect up to 99 different products in one configuration, based on an automatic product select from a PLC. An instant detection of bad seals and an instant rejection of the bad product is guaranteed.

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Packaging Sells

Vision Technology Guarantees Customer Satisfaction

Inspection of packaging in automated production is crucial. Many lines operate without manning and periodic sampling can be unsatisfactory. Some products may be dangerous or just create a mess if the packaging is faulty. In any case it is not good for the image of the brand if the packaging is less than perfect. To achieve a high and consistent standard, vision systems may be the only technology to apply.

Crate Inspection

When the beer crates are returned to the brewery they are emptied and washed. After that, they pass several cameras where the condition of the crate is checked. The handles must not be broken and the general shape should be acceptable. Each bottle pocket must be empty and the bottom grid pattern free of defects and debris.

The brand name on the side of the crate is checked to verify that it is in a reasonable condition and to detect foreign crates that must be rejected. The brewery does not like to put their products in the crate of a competitor. This is a major problem in Denmark where the crates are made from the same mould and used to carry the Danish standard beer bottle.

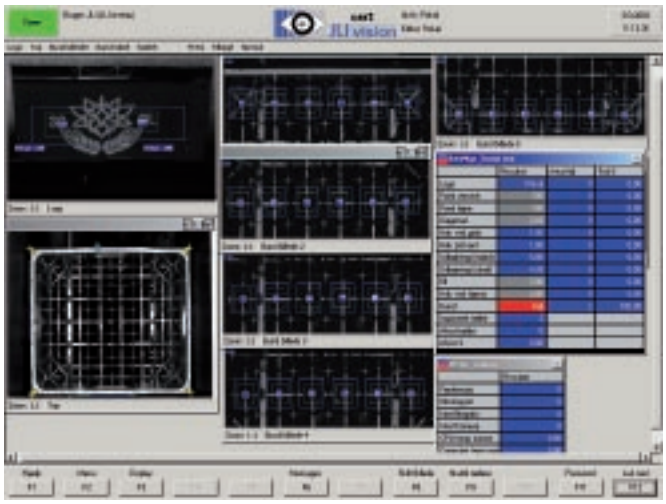
When the first system was specified in 1985 we were asked to reject all crates with a sharp deformation of 1 mm. The system was programmed and tested on sample crates to achieve this. When it was put in operation it turned out that about 50% of the crates were rejected. The crates were not in as good condition as the brewery thought. Then followed an extensive research where the production was fed through the system and measurements and statistics were generated. On basis on this, and common sense, the systems were reprogrammed to achieve a sound threshold between good and bad.

For the beer crates this was a question of the geometry and particular where on the crate the defects were found. Defects at the handles were critical because it could mean a broken handle that could give injury when handled. The method developed in 1985 has been used in all the following systems delivered to the breweries.

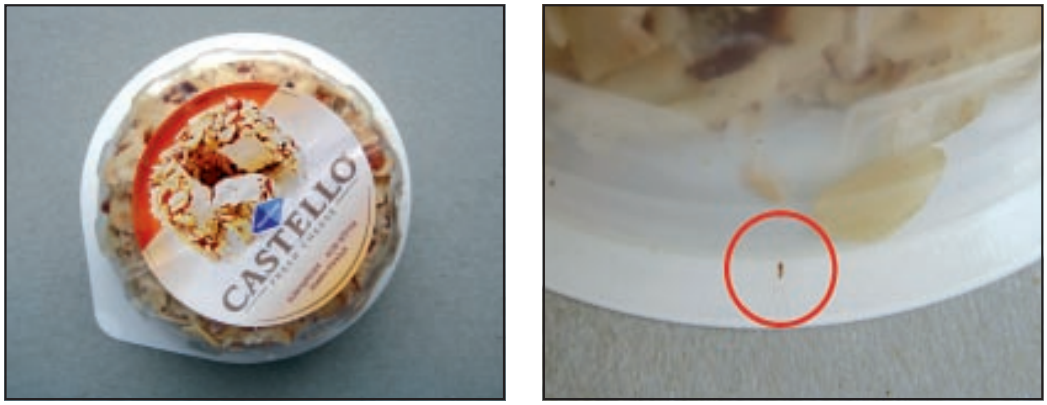
Detecting and accepting the brand name was a little more difficult. It was no problem to distinguish between the different brands, but when is the appearance acceptable?

For 25 years JLI has worked with the University of Copenhagen where the Department of Psychology is doing research into the human vision. Professors Axel Larsen and Claus Bondesen have experimented with different mathematical functions trying to emulate the human perception. The algorithms were too complex to apply in the vision systems in the early days but today GPU's can do the number crunching.

The technology is under development. It is the aim to use it as a general filter to



Statistics functions in the vision system are very useful for optimizing production



The weld is examined 360 degrees, and if it is found faulty the cheese is rejected and repackaged

be applied after pre-processing of the image in the many applications where the system has to judge if a product is "nice".

Cheese Packaging

The cheese is placed in the transparent tray and the lid is welded. The cheese is covered with herbs and spices and the small particles can easily leave the cheese in the highly electrostatic environment. They jump around and land on the welding surfaces. The welding will not be airtight and consequently the controlled atmosphere around the cheese will be contaminated.

The vision system looks at the cheese in its packaging with background lighting. The weld is examined 360 degrees, and if it is found faulty the cheese is rejected and repackaged.

This system is one of our oldest installations, and has just now been taken down for service after 17 years on fault free operation. It probably inspected 20 million cheeses in its service life.

Cardboard Box Inspection

SCA Mölnlycke in Norway employs JLI vision systems to inspect boxes with panty liners. Panty liners are not picked up on the super market shelf if they have a dent in the side or if the flaps are not sealed properly. Even though the product itself is perfect, it is sold, like many other commodities, on outward appearance of the box.

The boxes are printed in strong colours, many of them pretty dark to the vision camera. It is difficult to follow the contours of the boxes when the surfaces are highly decorated. To improve the image a Near Infra Red sensitive camera was used. In the NIR spectrum most colours appear bright, and this helps the vision system to distinguish between background and box.

The same application is now planned for an automated cereal packaging line in Australia. The basic principle will be the same, but the boxes will be presented in a different way. To enhance the contrast, backlighting will be used and the boxes will pass on two slim belts that only obscure a small part of the picture. The distortions of the box and the geometry of the ends will reveal if the ends have been closed and locked correctly.

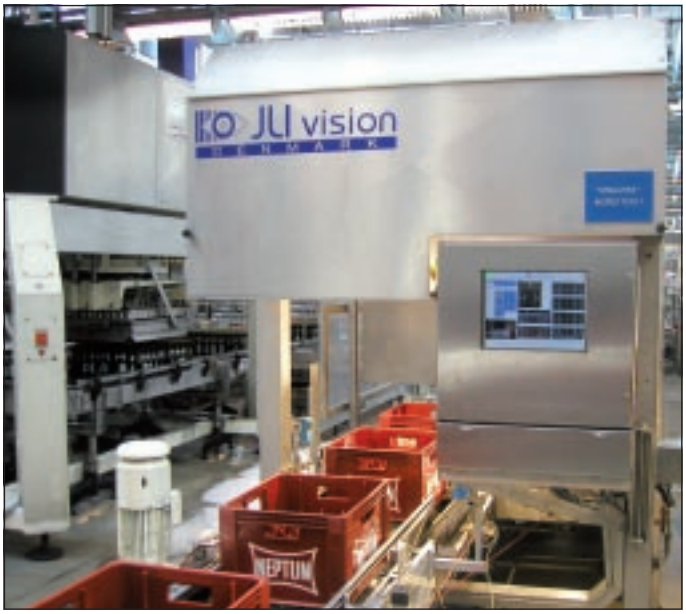
Sugar Bag Completeness

Sugar bags containing 2 Kg are filled at a rate of two bags a second. The bags pass on a conveyor with a distance of half the width of a sugar bag. This is sufficient to get a good view of all sides.

The packaging machine is very reliable and the defects are less than one in a thousand. However, if a bag is leaking it creates a mess. Another intriguing problem is that a pile of sugar bags on a pallet can collapse if the bags are not sealed properly. The mechanism is not obvious. If a bag at the corner leaks sugar the bag empties and will eventually break under the pressure from the bags above. Then the next bag will be under a high stress and this may also start leaking. Thereby the fault spreads through the pile and in the end the whole pallet can come falling down from a considerable height in the modern elevated storage racks.

This had happened, and it was the main reason why it was necessary to look at every sugar bag coming out of the packaging machine. This of course was a highly demanding operator job, that needed automation with a vision system.

The general rule was to follow the bottom and top geometry. The sides should be



In addition to strictly mathematical functions, the system has to judge if a product looks "nice"

The product is sold on outward appearance of the box

Every sugar bag coming out of the packaging machine needs to be inspected

straight and square. If the packaging machine failed there would be pieces of paper sticking out at the base or at the top, or the bag would not be symmetrical.

The system statistics showed that the packaging machine performance degraded under certain conditions. A little investigation showed that the humidity in the environment was an important factor. The statistics functions in the vision system again were very useful for optimizing production.

Surprises for QA

Some years ago we delivered an inspection system to a factory producing containers for pharmaceutical products. The production was made to strict quality demands, and all the defects were described in detail. It was our job as system suppliers to provide a system that could find all defects. The production had relied on statistical checking, and if there were problems, to check all containers. The reject rate in the production was about 3 %.

When the vision system was installed and operated to the QA rules, 10 % of the production was scrapped.

What do you do about that? In a strictly QA controlled environment you cannot just decrease the sensitivity of the vision system and accept another quality standard. If you keep rejecting 10 % you cannot supply your customers. You have in effect lost 7 % of your production and this meant investing in one more production line.

This is one of the nasty surprises that can follow the "successful" installation of a vision system. But the vast majorities of the applications result in a highly improved product, knowledge of the capabilities of the production machinery, documentation, optimisation of incoming products and processes, and of course labour saving.

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No Black Box to the Customer

GigE-Camera System Checks Cardboard Impressions

Foto: Tobias Dorner

With one of the first image processing devices to use Gigabit Ethernet technology, Kdorf Automation (based in Kempen, Germany) proves that this technology is suitable for daily use.

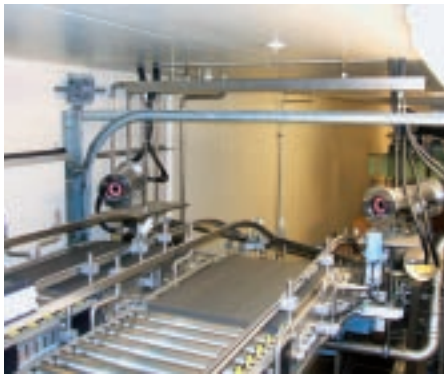
Kdorf Automation has installed an optical monitoring system to inspect cardboard impressions for a well-known manufacturing company active in the food industry. The system inspects cardboard impressions on two parallel production lines, validating various product specifications, such as production date and time plus the expiry date of the goods. Each line works with two cameras.

On each of the two lines, identical impressions are read on both the front and back of the cardboard boxes and the data (storage life, batch number etc) is checked for accuracy. In order to ensure that the operator can perform the tests manually, the data has to be printed on the cardboard in plain text. When positive test results are encountered, the data will be passed to the palletizing system via Profibus connections. This system stockpiles the cardboard boxes and prepares them for shipment. However, if an error message does occur, the relevant cardboard boxes will be removed. This procedure ensures that only correctly printed and readable boxes leave the factory so the customer only receives the goods they require.

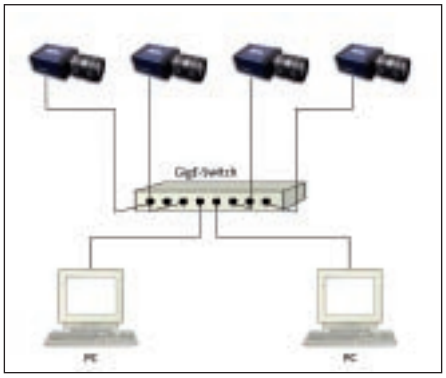
GigE Inside

One very important feature of this system is that it has been designed and built specifically for Gigabit-Ethernet. The cabling used in this system illustrates one of the main advantages of Gigabit Ethernet as an interface. The distance between the camera and PC is about 50 meters, which is easily achievable using standard, inexpensive CAT5 network cabling.

It is important to note that the system has in-built redundancy. It uses a central computer plus an identical standby-system. Both systems are connected by a GigE-switch. The system has been designed such that the incoming camera images can also be evaluated without

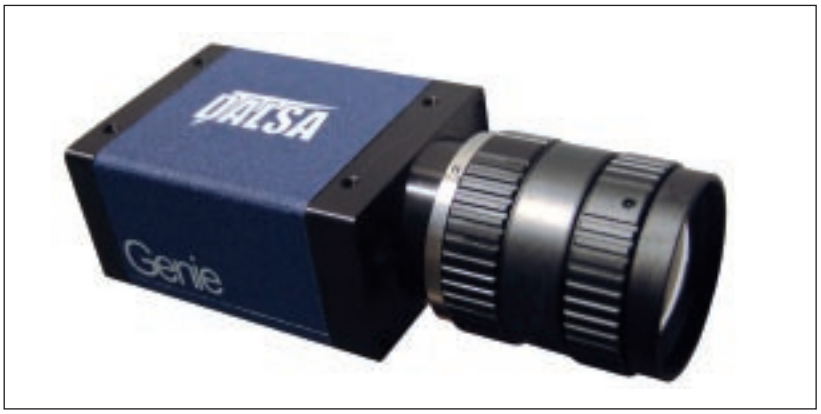


On two parallel production lines, each with two cameras, the vision system checks impressions on both the front and back of the boxes



Basic system structure of the image processing system with built in redundancy

The stainless steel, IP68 rated protective camera housings from Stemmer Imaging comply with all the strict food industry regulations



Four Genie M640 Gigabit Ethernet cameras from Dalsa are used for the image acquisition

maintenance disruptions in the event of computer failure. Should the main PC fail, the second computer automatically takes control of all four cameras in the system.

Even if problems occur with the cameras, this poses no problem: If one of the redundant cameras becomes defective on any of the lines, then only impressions on one side of the boxes are read. However, the system continues to function and simultaneously sends information about the malfunction to the fault reporting centre. Thus, continued production is maintained, even in the event of a camera malfunction, and the maintenance of the defective camera can proceed without halting the system.

Value Added Supplier

When selecting a supplier for the system components, Kdorf Automation relied on the long-standing experience of the Puchheim based image processing experts, Stemmer Imaging. "From the illumination, optical components and cameras, right through to the computer systems, we sourced all the machine vision hardware from Stemmer", explains Detlef Klüssendorf, Managing Director at Kdorf. "Our contact at Stemmer saved us so much time with the supply of all the appropriate components. Additionally, numerous feasibility studies were carried out to test the optimal operation of all the image processing components. It was also found to be very helpful that the camera configuration used on the image processing software also came from the same supplier."

Compliance with Strict Food Industry Regulations

Considering the hardware components, the final system consists of two IPC systems which are connected via a GigE switch. These are connected to four Genie M640 Gigabit-Ethernet cameras from Dalsa. In each case, the camera, lens, LED lighting, strobe controller and power supply have all been integrated into the V4A stainless steel housings thus minimising the installation work required by Kdorf. The camera housings are all IP68 rated in order to comply with the strict food industry regulations, and the camera's protective housings have also been supplied with splinter-proof polycarbonate housing windows. Pentax lenses were used with additional red filters to block unwanted daylight interference. CCS LDR2 red LED ring lights provide the illumination via strobe controllers.

"Because the box impressions vary due to the amount of pressure, positioning and size, we chose the Common Vision Blox vision software package from Stemmer Imaging", explains Klüssendorf. "We used the CVB Foundation Package plus the CVB Minos tool" he added. "Subsequently, these software components had to be adjusted to specific requirements such as varying contrast, different typefaces or correcting for perspective distortions on the box impressions."

Indeed, Klüssendorf is very satisfied with the results of the collaboration: "The system now operates six days a week in a three-shift operation and meets the requirements of the customer perfectly", said the manager happily.

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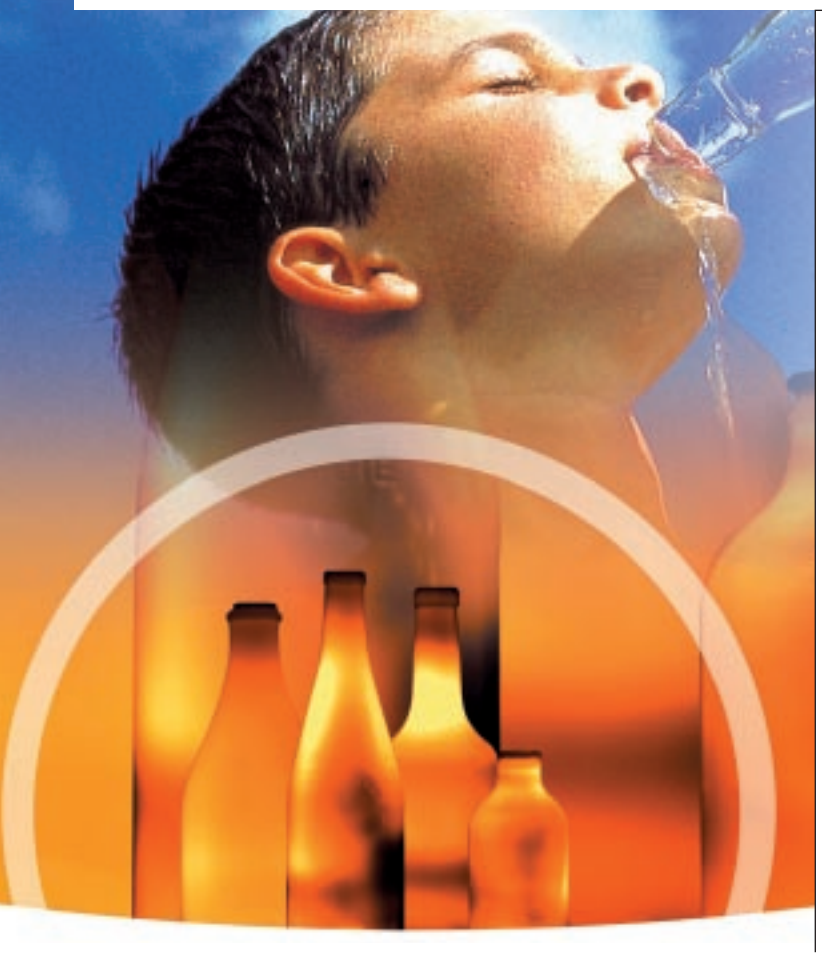
Thirsty for Innovations

A Variety of Vision Technologies Is Used to Ensure Perfect Bottles



In container glass production automatic lines are standard, due to the need to limit human interactions while improving output and quality. Vision inspection systems, as an integral part of the production lines, need to meet the ever increasing demands for speed, sensitivity and reliability. In addition, the systems capability to provide information about the production status evolves into a major benefit for the producer.

As a former subsidiary of BSN Glasspack, MSC has equipped 80 per cent of European production lines as well as many lines in the Americas, Africa and Asia with sophisticated bottle inspection equipment.

Three Functions in One Machine

The MCAL combines three functions in one unique machine and so ensures the complete inspection of the container body in one unit.

According to the customer's needs, the machine can be equipped with 3 different inspection functions:

- the inspection of visual sidewall defects
- the inspection of sidewall stress defects
- the dimensional inspection

The system takes advantage of the most recent technological developments in cameras and light sources, is fully integrated and able to adapt itself according to different production requirements.

The user-friendly interface based on Windows NT allows easy and quick adjustments to be made and offers immediate access to all the screens necessary for the various detection techniques. In addition, remote assistance from MSC can be made available.

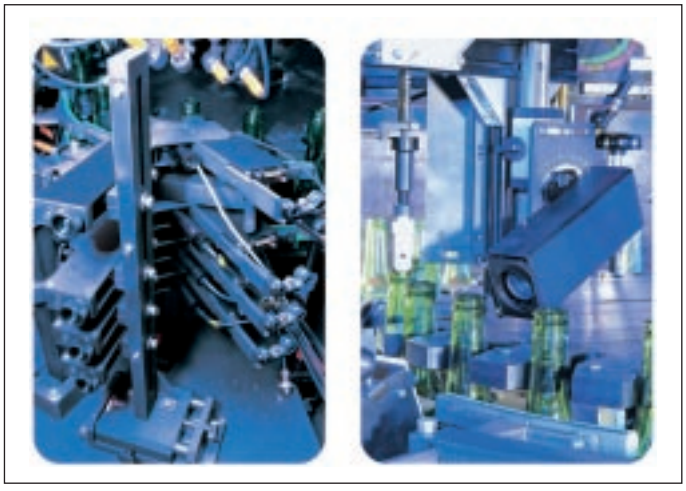
When the system is set up in a configuration with a Multistation with a mould number reader, the sidewall defect counters may be associated with their relevant mould numbers, thereby providing useful information for hot end process control.

All the parameters of the configuration may be filed and/or reset immediately, either locally, or remote by means of the interface network.

The MCAL represents the latest generation of sidewall inspection machines with cameras developed by MSC in order to meet the glass manufacturer's constantly increasing demands with regard to quality and productivity.

Base and Finish Inspection

The base and finish inspection machine Multi enables



Check and optical wall thickness measurement and NCI neck inspection camera

Multifunctional inspection units MCAL and Multi

up to seven inspection stations to be combined in the same frame.

The base inspection station is equipped with a high resolution matrix camera detecting defects in the bottom and up to the heel of glass containers. It can inspect round and non round containers of various sizes and of whatever color (from small baby food jars up to champagne bottles), narrow neck Press & Blow to wide mouth jars, flint or colored glass.

The base stress inspection station is an additional base inspection developed with specific polarized light so as to allow perfect detection of defects. This function allows to detect all related stress defects, especially when very small or when located in engraved areas or in heavy glass thickness (push-up).

The finish inspection allows to inspect the finished surface of cylindrical or odd-shaped containers without contact or rotation, for crown cap, threaded finish and also twist-off. The combination of high resolution matrix cameras and compliant light sources makes this unit cover all needs in the field of finished surface inspection.

Thanks to a top underneath camera position the Multi can comply with all types of code reading either dot or alphanumeric code for round or non round containers.

The system can save hundreds of records and thus allows an instantaneous job change, complete production traceability and remote maintenance access.

Rotating Inspection Machine

Based on 40 years of experience with more than 800 units in operation, MSC has launched the Check+, a new rotating machine dedicated to the inspection of plugs, dips, checks and to the control of

MSC Check inspection equipment

I-Care: Hot End Imaging

ovality and thickness. The standard machine measures internal and external finish diameters, inspects the finish for leakage, measures the height and detects all kinds of checks. It is also equipped with a mould number reader, allowing to associate the defects with the mould number.

A number of additional options can be integrated, such as the measurement of wall thickness, non contact ovality measurement, finish surface inspection. Extra channels for checks detection on the container's body, neck and finish can be combined in the system.

Finally, this machine is equipped with a user-friendly and ergonomic windows interface. Depending on the container type, the Check+ allows high speed inspection of up to 300 bottles per minute and beyond for small containers.

Thickness Measurement

Glass container breakage rates van be dramatically reduced with the Laser+, an online, non-contact thickness measurement device. It measures both minimum and maximum thickness and rejects defective articles.

Up to three measuring heads can be located at different heights, even in difficult areas such as the shoulder, body or heel. The device is either fully integrated into the Check+ system or it can be an option for most of the rotating frames supplied by MSC. It is easy to install and does not need any additional mechanical frames or space on the line. There is no need for multiple systems since thickness inspection is performed at high speed and it allows the operator to optimize bottle flow.

A wide range of glass thicknesses can be inspected from 0.5 mm up to 3.5 mm. Since there is no contact, spare parts requirement and maintenance costs are very low, job changes are easy and quick and sensors can be easily adjusted. The Laser+ provides a touch screen monitor with a high resolution display and minimal training is required to be able to operate the system.

Hot End Imaging

The new MSC Hot End Imaging system I-Care is composed of one (or two) high resolution IR camera(s) (equipped with a cooling system) to be installed along the conveyor just after the forming machine, taking up only 30 cm space in width, and a control unit connected to the cameras by optical fiber. Its screen allows direct access to the information and a remote supervision unit connected to Ethernet.

Automatically synchronized to the forming machine, I-Care analyzes the infrared radiation of the articles in order to evaluate their respective positioning on the conveyor (wrong spacing, stuck or down articles) and to detect critical defects (birdswings, big blisters, etc.). Bad ware (freaks, leaners, etc.) is rejected before the annealing furnace and before leading to bad glass distribution.

The short-term benefits of the I-Care are: immediate access to product information by cavity and safe rejection of critical defects. On the long-term it gives the main trends of the process and allows objective analysis of the process parameters, as well as it reduces the defect rate by anticipated detection and thus reduces the interventions on the line.

In order to offer a complete service to glass manufacturers, the MSC engineering department provides solutions for cold end as well as hot end customization. Innovation, high standard in inspection systems, quality in service and flexibility in time limits are MSC key factors for servicing the glass industry in the new millennium.

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MVC Uses Point Grey Cameras

Machine Vision Consulting (MVC) is a premier supplier of machine vision solutions with over 120 clients, 15 % of which are Fortune 500 companies, in different industries. One of MVC's core products, Circum-Spect, is an inspection product that verifies that the correct label or preprinted container is present as it exits the labeler, filler, or lid applicator. The consequences of mislabeling a product containing allergens or medications can be serious, so manufacturers of canned goods or pharmaceuticals must be able to verify that pre-printed labels correctly match or are correctly applied to the container with matching contents. The Circum-Spect system uses up to five Point Grey cameras – typically Flea2's, Scorpion's or most recently, Grasshoppers – to view the circumference of a circular object such as a can or bottle. Built on Cognex OmniView vision technology, it can perform accurate 360° inspection in a single image, without rotating or reorienting the part or slowing down the manufacturing line. Images from multiple cameras are combined to produce a virtual 3D container. The system eliminates blur and distortion effects and compensates for rotation, tilt, uneven lighting and perspective distortion. Once the virtual image is created, MVC's unique label verification solution is applied. "We chose Point Grey cameras for three main reasons: price, performance and capability," explains Jeffrey Dannay, a Principal with Machine Vision Consulting. "The systems we build typically require a number of features, such as fast frame rates, high resolution, external trigger capability, and high quality CCD image sensors, all at a reasonable price. In our experience, Point Grey cameras have addressed all of these needs." The cameras, such as the Flea2 and Grasshopper, are fully compatible with a wide range of image acquisition and vision processing software packages, including Cognex VisionPro, MVTec Halcon, National Instruments LabVIEW, Matrox Imaging Library, and ActiveDcam from A&B Software. Aggressive pricing, industry standard mechanics, full IIDC DCAM v1.31 compliance, and industry leading technical support further make Point Grey cameras an ideal choice for OEMs and system integrators.

www.ptgrey.com

Next Generation Print Inspection Products

With its expanding line of Printed Graphics Inspection products, Xiris demonstrates its commitment to Research and Development of leading edge products for makers of Optical Discs. Both the industry leading PI-2000 and the cost-effective PI-1600 Print Inspection systems, are able to inspect print colour quality and surface related defects resulting from the printing process, including pinholes, squeegee marks and scratches. The Print Inspection systems include a camera module with integrated lighting and optics, and a vision processor in a rack or panel mounted housing. Both systems' camera modules can be easily integrated into all types of printing machines – Digital, Screen, Offset or Pad Printing. All of Xiris products are available and supported worldwide with worldwide service & installation capabilities.

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New Sales Manager

Patrick Witte (28) becomes Isra Vision's new Sales Manager Can & Packaging for Europe and Asia. The company got a very positive response from the market to the launched CanExpert Inspection Technology. This progression is the reason for personnel resource increase for better serving the can making industry. After the recently realized extension of the service network for the can making industry Isra decided to increase global sales presence. Patrick Witte joined the company beginning 2007. After getting significant knowledge about the global vision markets in the packaging industry he joined the Can & Packaging sales team, effective August 1st, 2007.

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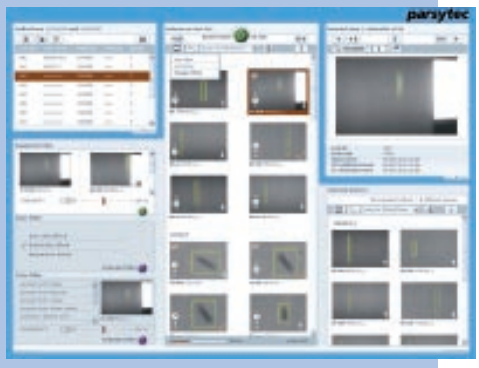
Surface Inspection Systems for Steel Industry



Parsytec has sold two surface inspection systems of their latest generation, espresso SI, to Benxi Steel in Benxi, China, via Parsytec's partner TMEIC-GE. Benxi Iron & Steel Group, a part of China's leading steel producer Anben Iron & Steel Group, ordered two high-end surface inspection systems for their mill in Benxi (China). As part of the HSM #1 revamp, the line will be equipped with Parsytec's surface inspection system. The HSM #3 will be equipped with espresso SI as well. After experiences with surface inspection from other suppliers, Benxi decided now for Parsytec due to the all-digital system architecture of espresso SI and due to the impressive list of references for hot strip mills. Another reason is the user-friendly user interfaces such as the newly released automated Classifier Build Environment CBE, which enables fast and efficient classifier building in an intuitively operable environment.

Parsytec AG
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Dirk Broichhausen Member of Management

Pixargus has strengthened its sales activities. New on board is Dirk Broichhausen, a manager with profound experience in the plastics industry. Not only is the company strengthening its European sales activities in its traditional market of inline inspection and measuring equipment for rubber and plastics profiles, but also new markets are becoming increasingly important for Pixargus. In the newly established position of Head of Sales Europe, Broichhausen will be responsible for managing the company's growth. Being a graduate in business management, Broichhausen has filled responsible marketing and sales positions with internationally renowned companies of the metals and plastics industries. At Pixargus his position is Head of Sales and Member of the Management responsible for the European market.

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Image Correlation for Speed Measurement

Innovative Optical Motion Sensor for the Packaging Industry

INTACTON IN BRIEF

Intacton GmbH develops, manufactures and distributes optical motion sensors for length and velocity measurement. The company was founded in 2004 and belongs to the Fraba group, which dates back to 1918, when its predecessor Franz Baumgartner elektrische Apparate GmbH, a producer of relays, was established. Today, the group consists of six independent companies focused on niches of industrial automation markets.

Intacton's optical motion sensors are designed for users and manufacturers of production machines, special vehicles, lifts and hoists. The product portfolio includes two product series, Covidis and Optipact, covering complementary market segments with different technologies. Based on spatial frequency filtering, Covidis is used for high precision applications and competes with laser doppler systems. Optipact is based on image correlation and provides a touchless solution that also competes against measuring wheels. There are two versions with different optical resolutions covering a wide range of industrial surfaces like, for example textiles, timber, cardboard, metals, plastics or concrete.

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Image Correlation for Speed Measurement

Innovative Optical Motion Sensor for the Packaging Industry

The main advantage of optical length and velocity measurement is the contact-free measuring method. The materials are neither touched nor damaged like measuring wheels with incremental encoders do, which results in significant benefits for a wide range of applications. Now, Intacton has developed a maintenance-free, miniaturized optical motion sensor for speed and length measurement. The new system, which ensures careful material handling, enables cost-efficient and precise measuring on a wide range of goods to be packaged and on packaging materials such as cardboard, plastic and technical textiles.

Limitations of Contact-Based Measuring Systems

In addition to an encoder and a measuring wheel, conventional measuring systems also contain a spring arm which presses the wheel to the measured material. To minimize slip, the required downforce is chosen depending on the material. This creates a number of problems for sensitive materials or structured surfaces: the measuring wheel needs to be readjusted for each different material, moreover, contact with abrasive surfaces quickly causes wear effects. Additionally, the measuring wheel may pick up particles from the measured surface which distort the measuring accuracy. Contact-based measuring systems therefore require constant maintenance. Another downside is the fact that measuring wheels may leave unwanted marks on sensitive materials such as textiles.

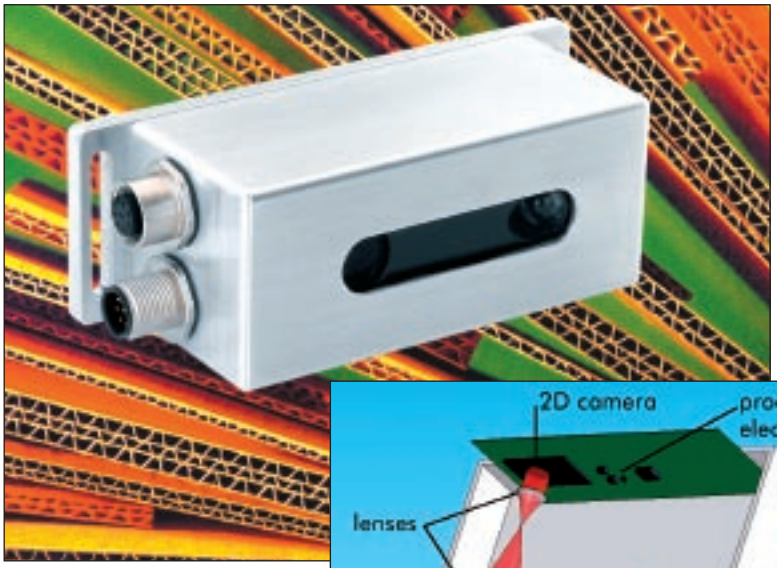
Advantages of Non-Contact Measurement

The cost-efficient Optipact system is the first motion sensor suitable for industrial applications which offers synchronous measurement of two orthogonal axes. This feature makes it possible to detect planar movements in any direction. Thanks to its non-contact measuring method, the sensor is suitable for a wide range of materials which cause problems for conventional measuring systems, such as rugged or structured surfaces. Measuring errors caused by slip, deformation or accumulated dust and dirt are eliminated, and, of course, the surface of the measured material is not damaged by pressure. Thus, Optipact ensures a reliable quality control of yard goods and bulk goods, thereby qualifying for use in a wide range of packaging industry applications. It also provides increased precision which enables users to minimize overproduction, resulting in considerable material savings. Initial expenses for the sensor system, which can be installed without special knowledge, are comparable to conventional measuring systems. While these solutions often were subject to mechanical wear, replacing them with already available optical measuring systems was not a viable option to date, since these were usually too costly and space-intensive, resulting in a very time-consuming installation.

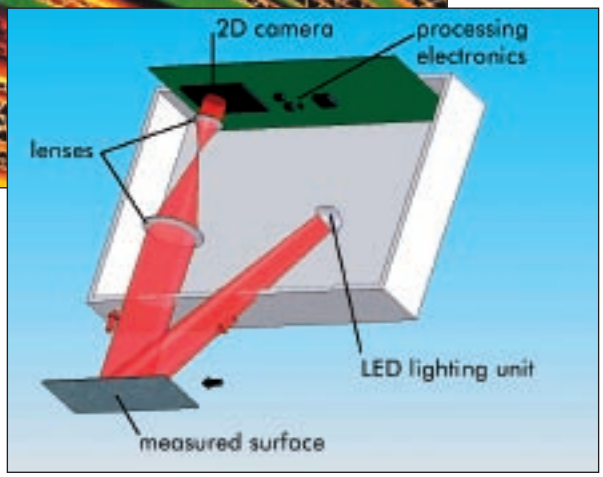
Technical Details

The sensors consist of an LED lighting unit, a 2 D camera, sending and receiving optics and processing electronics. The system recognizes the direction and beginning or end of the moving object by itself. Measuring 98 x 42 x 47 mm and weighing merely 250 g, it can be easily integrated into almost any machine or plant. Thanks to their incremental interface, the units can be used as a drop-in replacement for incremental encoders with measuring wheels. In addition to customized versions with different speed ranges or resolutions, the sensors are available in two standard versions:

	Optipact-S	Optipact-F
Velocity range	-4 to + 4 m/s	-1 to +1 m/s
Operating distance	40 mm	18 mm
Operating distance tolerance	± 10 %	± 10 %
Measurement uncertainty	< 1 %	< 1 %
Minimal optical resolution	65 µm	16 µm
Applicable surfaces	structured or rugged	less structured or smooth



Optipact is suitable for structured surfaces



Schematic view of the Optipact sensor system

Functional Principle

The measuring process is based on an optical correlation method, which enables Optipact sensors to detect and track the distinct structures of a surface within their field of vision. A special scale of reference is not required, but the camera images need to have a certain contrast. This contrast can be generated by the roughness of the surface, by printed structures or by a changing surface reflectivity. The sensors can be used with a wide range of standard industrial surfaces featuring minimal structural characteristics. Due to higher resolution optics, Optipact-F is even capable of measuring on different kinds of paper and smooth plastic surfaces.

Using a 2D array camera, movement within a plane, i.e. on an X and Y axis, can thus be measured. Thereby, one compact optical sensor can replace two mechanical encoders. The two-dimensional measuring method also allows users to safely and precisely measure unidirectional movement and does not require time-consuming adjustment. Even in an inclined position, the sensors calculate the actual resulting speed from the X and Y coordinates which in turn allows them to determine the corresponding distance. The spatial resolution of the movement results from the dimension of the camera's pixels and the imaging optics. The camera frame rate together with the imaging optics defines the maximum measurable speed and the maximum acceleration.

Suitable for Rugged Environments

The camera's field of vision measures 8 x 8 mm for Optipact-S and 2 x 2 mm for Optipact-F, however, only a small part of that is functionally required. Therefore, dust and dirt particles usually do not impair precise measuring. Moreover, dirt accumulation on the window can be reduced by installing the sensor above the surface or vertically. In very dirty environments, a flow of compressed air can be used for protection. An integrated control loop adjusts the exposure time to environmental conditions and can also be used for continuous monitoring. An output signal and a diagnosis LED are activated when the brightness falls below an adjustable limit. This information can also be used for preemptive maintenance measures, e.g. cleaning the window.

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On the Safe Side with X-Ray Inspection

Ensuring Customer Safety and Protecting Brand Integrity

Wouldn't you want to be 100 % sure that the food you are feeding your baby does not contain glass splinters and that you won't break a tooth while eating pistachios at the movies? The new generation of X-ray inspection systems can provide exactly that. Mettler-Toledo Safeline metal detectors and X-ray systems ensure compliance with legislations and industry standards protecting the customer's brand.

Contaminants can even be detected through metallised foil

Trusting a Brand

For the consumer having confidence when eating, drinking or using healthcare products is essential and he is becoming more and more conscious of his purchases. Metal, stone, glass and high density plastic are contaminants that need to be reliably eliminated from end products. The food, healthcare and pharmaceutical industries are striving to provide their customers with only the highest product quality and safety, creating brands that consumers can rely on. Hence, reliable inspection gives producers a competitive edge.

With AdvanCheK no previous X-ray knowledge is necessary

For Multinationals Only?

Now, all of this sounds highly specialized and only suitable for larger companies with expertise in X-ray. Brand integrity is just as important for smaller producers as it is for a multinational. But when it comes to X-ray inspection many smaller manufactures doubt such systems can be easily handled. Mettler-Toledo Safeline has designed a contamination detection system that does not require any previous knowledge in X-ray inspection: AdvanCheK. A fast, reliable and economical way of providing product safety and brand protection for all manufacturers. It reliably detects contaminants including metal, stone, glass and bone without being difficult to use. "AdvanCheK is revolutionary. It brings together easy operation and the highest product safety", says Gemma Duffy from Safeline. She adds, "The system requires hardly any training as the user is led through each step with a very intuitive touch screen interface. That's what our customers are looking for."

Any Package, Any Product

Sonneveld Group B.V, a leading supplier of bread improvers and mixes to the bakery industry has integrated AdvanCheK into its production process. Some of the products are packaged in thick metallised film to improve product freshness. Still, contaminants including metal down to 1.2 mm are reliably detected assuring the quality and safety of the bread mix. And what's more – Sonneveld installed the system themselves; it is that easy to use.

Finding the Odd Piece of Glass

Previously, finding a needle in a hay stack was hard but with modern metal detec-

The GlassCheK system can check up to 1,000 jars per minute

tors that needle is easily found. The consistency of a needle is very different from hay. The high density material – metal – is spotted without difficulty in a pile of less dense plant residues. The challenges today are more complex - detecting a small piece of glass in a glass jar for example. In that case, the material to be identified is the same as the material surrounding it.

Wherever glass is used in a production chain there is a chance that a glass splinter from a broken jar might contaminate the content of another jar. GlassCheK by Mettler-Toledo Safeline can detect these small pieces of glass. Powered by low energy X-rays the GlassCheK system ensures the maximum probability of detection of glass contaminants throughout the jar or bottle and other foreign bodies such as stone, metal, bone and high density plastic, affording superior product safety. Integrated into a production line up to 1,000 jars per minute can be inspected, while at the same time fill level and mass are verified. Additional flexibility and uptime is achieved with the automatic adjustment of the X-ray settings to different sizes of jars.

Safety for Baby Food

Procordia Food AB, a Scandinavian producer of baby food has selected GlassCheK for their production line. The company is especially satisfied with the product safety achieved through the efficient contamination detection. Kirsten Andersson in charge of quality control remarked that even contaminants at the very bottom of a jar are detected. While product safety is crucial the perfect integration into the production line is also important for high productivity. The GlassCheK system combines the flexibility to inspect different jar sizes with high throughput thanks to a high level of automation. And if a foreign object is ever found, the system helps Procordia to fully investigate and trace the contamination back to its source.

How Does X-Ray Work?

X-rays are a form of electromagnetic radiation that were discovered to have an extraordinarily useful property: X-rays passing through a sample are absorbed by material in the sample. If placed between a source of X-rays and an X-ray sensitive receiver the interior of the sample can be pictured. How? The denser the material, the fewer X-rays reach the detector. In this way, X-rays allow you to "see" inside opaque objects and to identify areas of different density or composition.

In packaging applications the product is transported along a conveyor, which passes between the X-ray generator and the detector. The detector is made up of a linear array of photodiodes which are covered by a scintillator. The detector measures the level of X-rays that pass through the product. Each individual photodiode (pixel) measurement is converted to a grey level value. The pixels are then combined, line-by-line, into a formatted image, which is analyzed by a built-in purpose-designed computer.

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A Touch of Class

Reproducible Documentation of Visual Impression

The packaging, labelling and coating of goods is the customer's first contact with the product and thus fulfils three main objectives: Attracting attention, providing information about the content and protection of the product. The packaging, labelling and coating will mainly be stressed by the human hand. It is mandatory to simulate those scenarios of stress and damaging as close to reality as possible and to document the results fast, credibly and reproducibly.

Customers are made to believe, that their decision to buy a product was made independently and without any outside influence. The truth is, that many surface parameters create – while examining and touching the packaging – reactions in the customer's subconscious. These reactions, initiated by a well tuned interaction of optics and haptics, inspire unconscious emotions, which are crucial for a purchase decision. In the case of an uncomfortable feeling while first handling the product, a negative judgement is made and the product will be rejected.

Simulation of Manual Abrasion

Highly decorative packaging in the cosmetics industry can very often come in contact with the contents and the integrity of the packaging can be compromised by the product itself. For medical products especially the packaging must fulfil the highest standards for durability for safety reasons. Warning notices and instructions for use are written down on the packaging. Bleaching, wear or abrasion may have disastrous consequences for human health, worst case they could be deadly.

The simulation of soft chemo-mechanical manual abrasion is tested reproducibly according to the standard DIN EN 60068-2-70/ISO 68-2-70 by the Abrex machine. The system is easily calibrated and can be used for testing the product from the development stage right up to being used for quality assurance during mass production. The system can be quickly and easily modified according to many different specifications. The variety of materials and testing media is almost unlimited.

But simulating wear scenarios is useless, as long as an objective routine for testing and documentation is missing. The Traceit measurement system is closing this gap, most notably where flexibility and mobility is concerned.

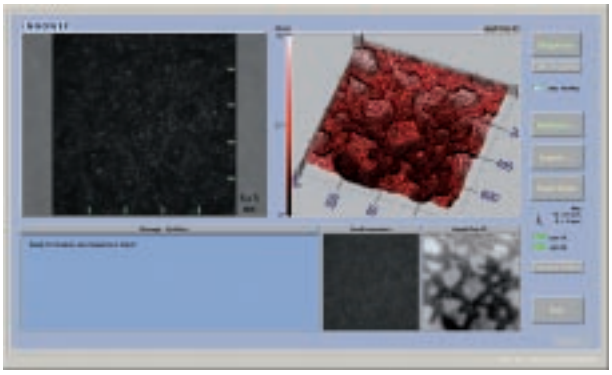
Surface parameters like visual impression, topography, roughness, structure, texture and shagreen of the surface can be determined with one easy measurement step. The measurement system works with high repeatability, can be easily calibrated and is fully mobile.

Variety of Surfaces

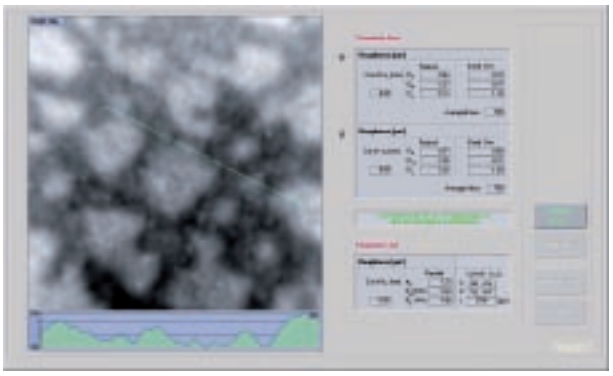
To meet increasing requirements material surfaces are becoming more and more modified with respect to micro and macro structure. These structural properties are reflected in roughness, shagreen, waviness, porosity or gloss. This quality look will be noted by the human eye and transformed into a visual impression. Within this subconscious process the surface is characterized and judged within a split second by the viewer. Hence, it is not surprising, that topography and colour have an effect on the visual impression.

The evaluation of surface texture with respect to its functional behaviour has become greatly important. The suppression of reflectivity, tactile properties like haptics or softness have become important goals in product and packaging design. The in situ high resolution recording of micro- and macro topography, i.e. roughness, shagreen, structure and texture is required. The measurement and evaluation system has to acquire three dimensional data quickly. Exact values with standard deviations are needed. The visual impression of a surface area has to be transferred into mathematical values and exact numbers. This has to be done

The Traceit measurement system in mobile use



Visual impression and 3D-topographical key figures are recorded in less than a minute



All values are displayed graphically and numerically

in a reproducible way including the value of standard deviation.

Reproducibility, ability to calibrate and portability are the most important factors when evaluating optical imaging techniques and systems.

Measurement of Visual Impression

The Traceit measurement system records visual impression and 3D-topographical key figures within less than a minute with one measurement. Values are not only recorded but also documented and the integrated software analysis tool can calculate a variety of important parameters for roughness, structure and shagreen. The visual impression is evaluated and transferred into optic-visual key parameters within the measurements and analysis procedure. All values are displayed graphically and numerically including the value of standard deviations. The evaluations will be performed in the machine and cross directory.

The patented technology of the Traceit system is the advancement of the so called “shape-by-shading” principle. A highly sophisticated system containing precise illumination and optics generates specific optical scenarios, which are detected by a high resolution detector and calculated into highly precise topographic information. The visual impression is documented by a 2D intensity mapping and is also characterised with key parameters.

Broad Application Field

The portability of Traceit allows high flexibility when dealing with the product. The field of application is broad, from research and development of sample specimen up to QA of the final product. It can be even used for on-site inspection after a complaint from a customer.

The system is excellent for quick non-contact measurement and documentation of visual impression and surface parameters for design, development and production, for visualisation of problems during production and the evidence of elimination.

The Traceit measurement system consists of a small and easy to operate sensor head, which is connected via cable to a small modified special notebook. All required hard- and software for measurement, data acquisition, visualisation, documentation and analysis is implemented in the system. As such it is a true plug-in and play system.

Durability of the visible surface of products is long since of increasing importance to the product designer. But up to now it was not possible to record and evaluate the impact of the visual impression in micro- and macro-topography fast and flexible. The testing of functionality and durability of a packaging e.g. with the soft-chemomechanical manual abrasion tester Abrex can now be objectified, the results are documented and preserved as important product and process know-how.

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Make Sure it´s Dry!

Moisture Imaging Using IR-Cameras

Food analysis for quality control and consumer protection makes use of many different methods, each tailored to a specific objective and a specific part of the electromagnetic spectrum. Near-infrared light, for example, is used for spectroscopic measurement of the sugar, protein, water, and fat content of natural foods to determine their quality. Near-infrared light is also useful for high-speed rice sorting, as reflectance values can indicate whether individual grains are good or spoiled. Making use of the IR spectrum to detect moisture in food packaging is a new approach with the first steps towards it described in this article.

The human eye is capable to see the optical spectrum between the wavelengths of 400–700nm. Even within this small range a large number of different materials can be distinguished by their different colours or in other words different spectral absorption and reflection behaviours.

Some materials do not show any specific characteristics within this spectral range, e.g. water is more or less completely transparent for the human eye. Water has its absorption band in the near infrared region between 1.45 and 1.94 µm. The absorption by water in the near infrared region is fairly large, it arises from the combination mode of the stretching mode of the O-H group (3,655 cm^{-1}) and the deformation mode of the O-H group (1,595 cm^{-1}) and the second harmonic of the stretching mode.

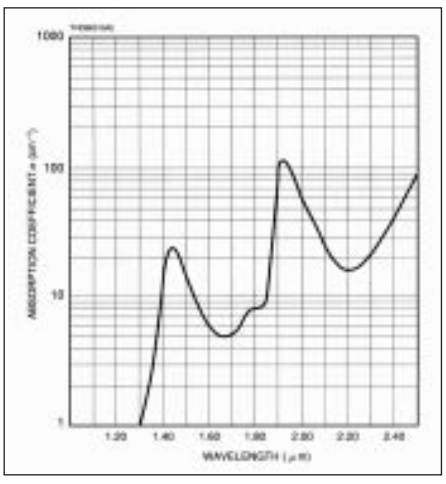
The Hamamatsu IR camera applies this fact two-dimensionally, thus making it ideal for use in various moisture detection and comparison.

Applications such as moisture detection of food or pharmaceutical products, even capsuled inside IR-transparent packagings, are possible and of particular interest for quality assurance in the production or incoming products inspection.

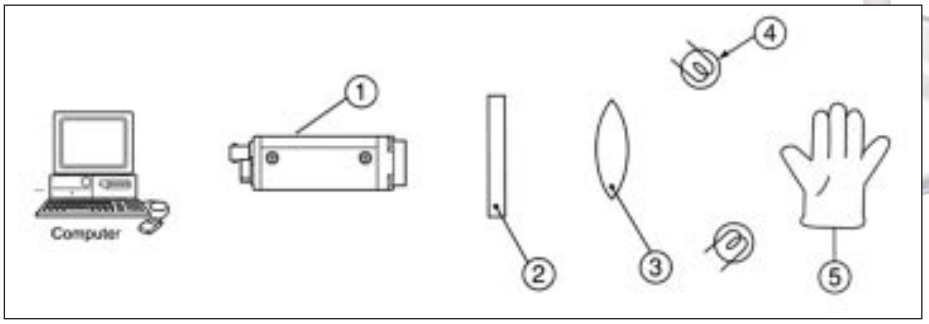
Proof of Principle

To proof this principle for real applications some tests were made which are described below.

A sample of a dry and a wet glove was inspected within this optical set-up: the dry glove had a room moisture content, whereas the wet glove showed a moisture content of 33 %. This moisture difference is clearly shown in the corresponding intensity measurement of the IR intensity.



Absorption coefficients of water at 25 °C



1: IR Camera; 2: Band pass filter for 1.94 µm, (Tmax 51%, Δλ ½ = 30 nm); 3: lens, f = 50 mm; 4: lamp, e.g. Nitraphot 250 or 500 W; 5: glove (for moisture evaluation)

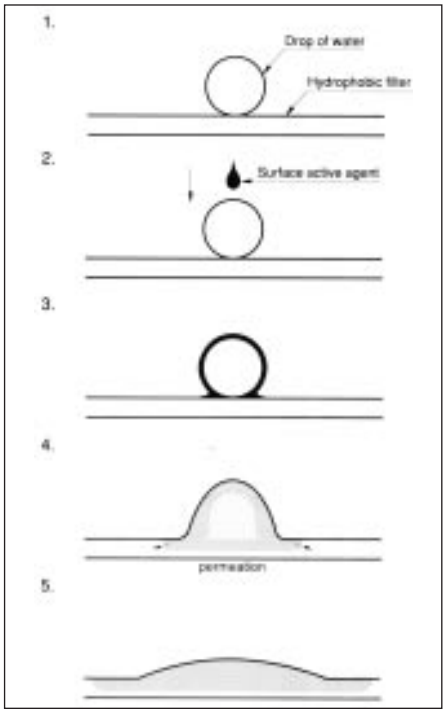
Packaging Tests

Another example shows the validity of the method with the moisture distribution of tablets. The wet tablet appears black because of its high absorption, the dry tablets are white.

The inspection for moisture in packaging can best be shown with the analysis of water dispersion in a hydrophobic membrane filter. This filter is similar to the paper or cardboard materials of packages for various products such as food, pharmaceuticals, electronic components and so on.

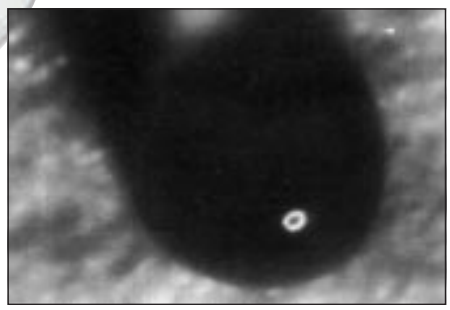
The tests were done with a drop of water onto the membrane filter and the result was observed under the microscope. When a surfactant was added to the water drop the water permeated into the membrane. The moving images of the water drop during the permeation were taken by the IR-camera and the infrared absorption was recorded at five stages.

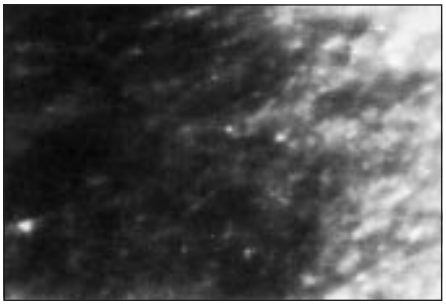
The absorption images from the reflected light inevitably contain the light scattered on the surface of the samples. To reduce the contribution of surface scattering we took the ratio of two images collected at the two different wave-



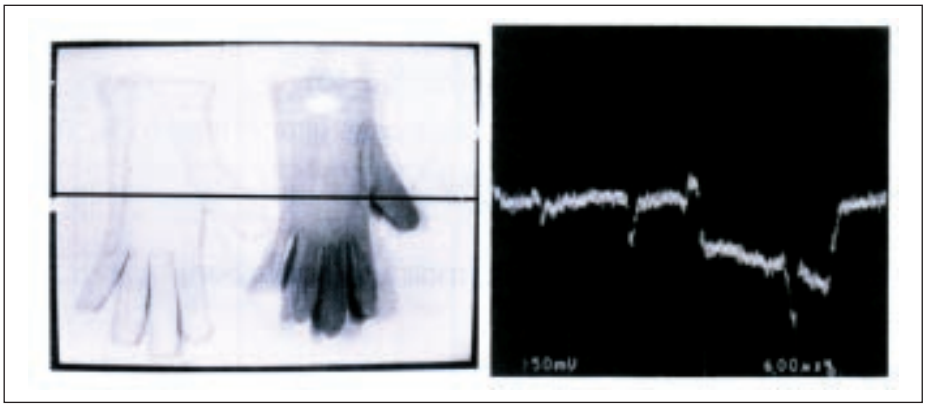
Water filter
The graph above shows the five stages of the recorded permeation

1. **The drop of water with surface tension is on a hydrophobic filter. It is black because of the water absorption**
2. **Drop the surface active agent on the water**
3. **The drop of water is wrapped up in the surface active agent**
4. **The water permeates the hydrophobic filter gradually because of the surface active agent**
5. **The water permeates the hydrophobic filter completely**

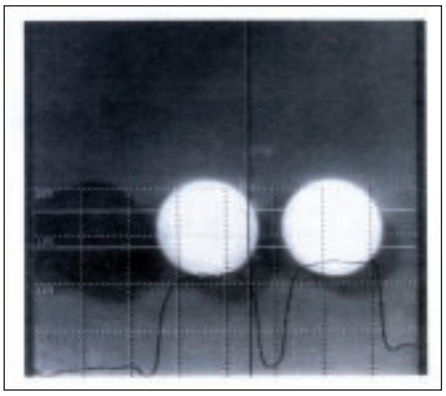




Water permeation: drop, stage 1 and drop dispensed, stage 5



The moisture difference between the dry glove (room moisture content) and the wet glove (moisture content 33%) is clearly visible in the corresponding intensity measurement



The wet tablet appears black, the dry tablets are white

lengths where the absorption coefficients of water are greatly different and the intensities of the surface scattering are almost equal.

For example, the absorption spectrum of water steeply increases at the wavelengths between 1.8 and 1.94 µm while the intensity of surface scattering stays almost unchanged between the wavelengths. Therefore taking the ratio of the images collected at the two wavelengths cancels the contribution of the surface scattering and the obtained image results mostly from the absorption by water. On the other hand the ratio between the images taken at 1.68 and 1.94 µm contained more surface scattering effect. The difference of the two ratio images was clear.

Outlook

With the IR-camera system it is possible to perform the non-destructive and 2-dimensional measurement of water absorptions in various materials. Even for materials capsuled inside IR transparent packages safe detection is ensured. For industrial applications the IR-camera hardware is already available but for fast quality control and production surveying special image processing software will still have to be developed.

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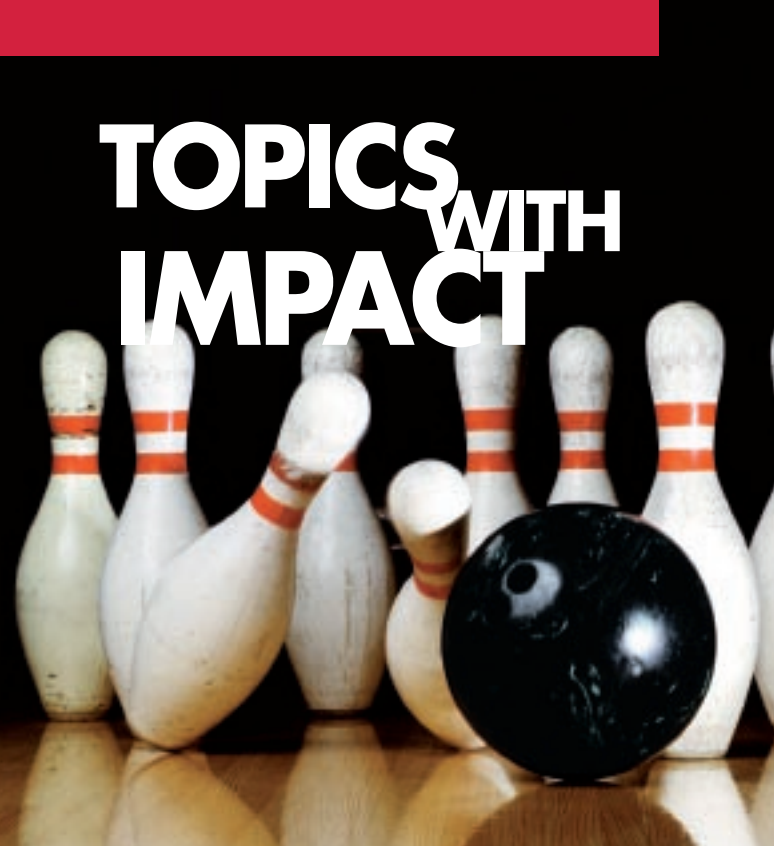

All you ever wanted to know about Machine Vision Software

Panel discussion with the Market & Technology Leaders

Did anything important get developed after the fast correlation tool in the early 90s?
Can complex algorithms be combined with user-friendly interfaces?
Can the 1/40 pixel be surpassed in accuracy? Was the 1/40 pixel not a myth anyway?
Will the future of Machine Vision be a CD ROM product? By Microsoft?
What is state-of-the-art in Vision software and what can be expected in the upcoming years?

VISION 2007, Stuttgart, Germany
Wednesday, 2007 November, 7th, 2 pm
Forum Industrial Vision Days

François Bertrand
VP Sales & Marketing, Matrox Imaging, Canada

Christian Demant
Managing Director, NeuroCheck, Germany

Rob Giesen
Senior Group Manager NI Vision, National Instruments, USA

Volker Gimple
Software Development Manager, Stemmer Imaging, Germany

Dr. Olaf Munkelt
Managing Director, MVTec Software, Germany

Bill Silver
Senior Vice President R&D, Cognex, USA

Thor Vollset
Managing Director, Tordivel, Norway

Moderation: Gabriele Jansen
Editor-in-Chief INSPECT, GIT Verlag

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Easily Capture Thousands of Features per Vehicle

Carl Zeiss 3D Metrology Services GmbH recently received an order from Daimler-Chrysler to implement a πWeb quality data management system at their factory in Sindelfingen, Germany. πWeb and the quality database (QDB) for process monitoring were developed as a joint project by the Carl Zeiss Innovation Center for Metrology in Dresden, Germany, eXXcellent Solutions in Ulm, Germany, DaimlerChrysler Research in Ulm and the Daimler-Chrysler factory in Sindelfingen. πWeb enables users to analyze, evaluate and display process and quality data in real time. The interactive reports contain all relevant process parameters. In the metrology area of the Sindelfingen factory, employees expect πWeb to deliver clearly higher efficiency when preparing the measurement reports and for change management, as well as improved functionality for statistics and the documentation of the history.

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3D Camera

Vialux developed a 3D camera for the acquisition of full-field 3D surface data with speed and resolution comparable to CCD cameras. The sensing principle of the z-Snapper is based upon full-field triangulation. Speeding up the projection of sequences of light patterns is achieved by the use of the DMD Discovery digital micromirror device of Texas Instruments. Vialux supports this MEMS device with its own electronics that enables for 3D frame rates of 25 Hz for the VGA resolution and 40 Hz for the ½VGA resolution, respectively. Each VGA 3D frame represents 300,000 independent measurements of x, y, z coordinates on the object surface. The short recording time enables not only hand-held operation or fast in-line applications but also the recording of living objects. Multiple z-Snapper cameras can be combined for recording 3D scenes, for example in computer vision.

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Computer Tomography in Coordinate Measuring Machines

Based on the smaller TomoScope the TomoScope HV by Werth Messtechnik can be considered the "XXL version." It can measure parts up to 40 kg and has an extra large 2,000 x 2,000 pixel X-ray sensor. With a tube voltage of 225 KV, it can measure high-density components (aluminum, steel, titanium, elastomers, hybrid plastics, 2K, ceramics, fiberglass-reinforced plastics, etc.). Werth's advantage in coordinate measuring machines with computer tomography is that while others can only "X-ray," the Werth TomoScopes can actually measure. The patent-pending process (auto correction) guarantees Werth, as the sole provider of accurate measurement data with traceability of tomographic measurement results to the standards of the PTB (Physikalisch-Technische Bundesanstalt – German Federal Physical and Technical Institute). The TomoScope delivers results in CMM quality in compliance with ISO 10360.

Werth Messtechnik GmbH
Tel.: +49/641/7938-0 • mail@werthmesstechnik.de • www.werthmesstechnik.de

New System for Optical Radii

During EMO, Alicona will present the EdgeMaster, a new product for the robust optical form and geometry measurement of cutting edges. The new system optically measures crucial parameters such as radii and angles of cutting tools. Measurements reach a vertical resolution of up to 10 nm and radii are measured in the range of 3–150 µm. The EdgeMaster can also be used for wear analysis and the measurement of tolerances. The new system of Alicona is based on the needs and requirements that manufacturers today face in tool and mold making. It can be used in the lab and in production for quality assurance during the entire manufacturing process, from the blank component to the finished product.

Alicona Imaging GmbH
Tel.: +43/316/4000-700 • info@alicona.com • www.alicona.com

Video Measuring System

One of the leading global suppliers of advanced automotive technology has become the first company in Europe to order an iNexiv VMA 2520 video measuring system from Nikon. Denso Otomotiv Parcalari, will be using the newly-launched, bench-top system to make rapid checks on the quality of bought-in metal and plastic components destined for use within its climate control systems. Specifically designed for 3D work pieces, the iNexiv VMA 2520 will take the place of manual callipers and greatly simplify the company's rigorous quality control checks. In addition to measuring components, the company will also use the stitching feature on the iNexiv's AutoMeasure software to capture images of parts that do not comply with its strict target tolerances.

Nikon Instruments Europe B.V. • Tel.: +31/2044/96222
corporate@nikoninstruments.eu • www.nikoninstruments.eu

Videoscopy Roadshow

In September 2007 Olympus presents the new flagship of industrial endoscopy in five German cities: Düsseldorf, Frankfurt/Main, Munich, Berlin and Hamburg. The slogan: Discover all angles of the world with IPLEX FX. The videoscopy system includes all functions, that users need for mobile inspections and explorations. The Roadshow offers the insight of evolution in industrial endoscopy. All dates and other information could be requested under contact: Karin Volkmer, Tel. +49/40/23773 3202 or by Mail roadshow_iplex-fx@olympus.de.

Olympus Life and Material Science Europa GmbH
www.olympus.de

Remote Industrial Viewing & Inspection

Moritex offers a comprehensive range of affordable rigid and flexible borescopes and endoscopes. The scopes are furnished with a portable 12 v battery pack and a halogen bulb in the probe tip to provide bright illumination for conducting visual inspections in the darkest and smallest of cavities. All borescope and endoscopes from Moritex are waterproof and constructed of stainless steel, inert industrial grade polymers and equipped with the highest quality optics for a clear focused image with true colour rendition. Industrial grade borescopes and endoscopes were conceived for remote viewing and inspection in virtually any limited access situation including: Machinery repairs, aircraft, automotive and diesel engine inspections into combustion chambers, heads, manifolds, gear housings, rotors, transmissions, wing interiors, doors and internal wall inspection for pest control, construction and or building code purposes.

Moritex Europe Ltd.
Tel.: +44/1223/301148 • sales@moritex.com • www.moritex.com

Virtual Slide: Real Analysis

Olympus has introduced the updated dotSlide digital virtual microscopy system, which scans entire slides at high resolution and fidelity, making them accessible and fully navigable anywhere on the globe. The three available models enable users to examine the virtual slide as if they were viewing the original on a microscope. The dotSlide is the perfect system for all aspects of pathology and research, meaning that users can review cases without being near a microscope. This also enables quicker second opinions and remote consults, as well as consistent training and discussion. The unique technology also ensures that the dotSlide range provides high throughput and high content capabilities for both pathology and research applications.

Olympus Life and Material Science Europa GmbH • Tel.: +49/40/23773-5426
microscopy@ olympus-europa.com • www.olympus-europa.com

New Image Acquisition Software

With newly added functions and icons, Version 2.5 of CapturePro control and image acquisition software optimizes operation control of ProgRes microscope cameras from Jenoptik Laser, Optik, Systeme. A clearly increased live image rate and revised symbols make work with ProgRes microscope cameras even more easy and ergonomic. The monitor provides tools for convenient alignment of the specimen and the microscope, thus warranting expeditious and professional workflows at very high image quality. A brand new option of Capture Pro 2.5 software is continuous exposure tracking, which means that exposure time is continuously monitored and readjusted, for example, following a lens change. This helps users save setup time and is more specimen-friendly.

Jenoptik Laser, Optik, Systeme GmbH • Tel.: +49/3641/65-3963
progres@jenoptik.com • www.progres-camera.de

Automated Infrared Measurement

The infrared measurement systems Ircam Argos are specially designed for NDT (non destructive testing) applications. Based on latest infrared technology, they permit a fast, objective and automated 100 % quality testing. Argos systems are particularly suitable for the industrial quality control allowing the automated "i.o." / "n.i.o." classification of materials, components and products. The systems consist of an infrared camera, an excitation source and an evaluation unit. The measurement procedure is automated and customer optimised. Thanks to a specially developed software examination and evaluation are done by the IRCAM Argos system autonomously.

Ircam GmbH • Tel.: +49/9131/970098-0 • info@ircam.de • www.ircam.de

State-of-the-Art Non Destructive Testing

A Titanium 560 IR camera system from Cedip Infrared Systems has been selected by the Engineering & Design faculty at the Swansea Institute to provide consultative services to local industry in South Wales and to be used as a teaching tool for students involved with a new MSc course in Non Destructive Testing. The new Masters degree, validated by the University of Wales, starting in October 2007 is the only MSc course in Non Destructive Testing (NDT) in the UK. The Swansea Institute is the lead academic partner in the NDT Validation Centre, and through this partnership has developed strong links with The Welding Institute (TWI) - an internationally renowned research organisation. Using its expertise in NDT, the Swansea Institute has also developed a reputation for studying the properties of architectural glass and is often called upon to offer consultative services to the large Welsh automotive component supplier community.

Cedip Infrared Systems • Tel.: +33/1/6037-0100
cedip-marketing@cedip-infrared.com • www.cedip-infrared.com

Seamer Control

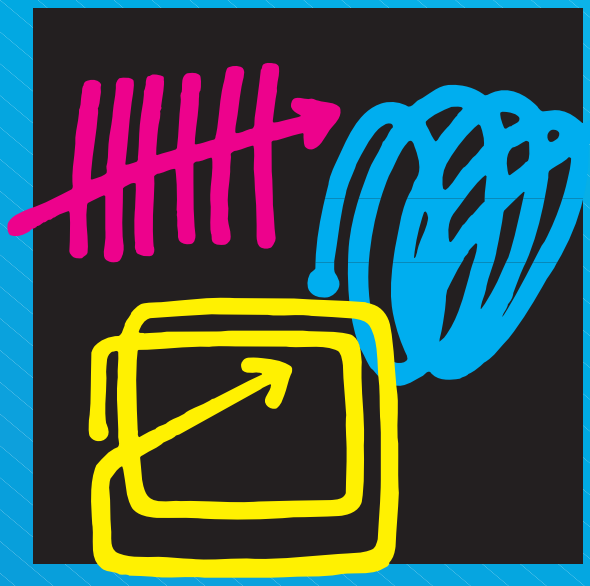
The clearance gauge from Quality By Vision is a superior tool for achieving fast and precise seamer set-ups by allowing practically any operator to optically measure the relative positions of rolls and chucks directly within the seamer. This greatly reduces changeover time, which in turn allows to changeover more frequently with the confidence that set up will be right the first time around. All this leads to fewer customer complaints for seam dimensional issues and the smaller batches result in less inventory. Making sure the seamer is set to its optimal settings is important, but just as important is making sure that the toolings are in workable condition. The 2nd step of the 3-part system is the inRoll 9000/HR. Using a non-contact, laser based, scanner – inRoll 9000/HR is able to scan contour profiles of both seaming rolls and chucks easily and quickly. The 3rd step in the 3-part system is the newly improved high-definition seam inspection system – SeaMetal HD.

Quality by Vision
Tel.: +972/4-9591147 • support@qbyv.com • www.qualitybyvision.com

100 % Inspection in Tube Manufacturing

Already for several years, Aicon's TubeInspect has been securely established in the area of optical 3D tube measurement. Thanks to continuous further development, the measurement system is now ready for 100% inspection in high volume production. As the only available solution, TubeInspect allows for the inspection of different tubes from several bending machines. Furthermore, when applying a robot for placing a tube in the measuring cell, the inspection is conducted fully automatically. The system allows for high-precision measurement of tube geometries, determines set-up and correction data and transmits them to bending machines. The time required to inspect a tube is small: For short fuel pipes, the measuring results are available after three seconds; the inspection of a complex brake pipe can be conducted in less than 60 seconds.

Aicon 3D Systems GmbH
Tel.: +49/531/5800058 • info@aicon.de • www.tubeinspect.de • www.aicon.de



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Visionary

Interview with Vladimir Tucakov, CEO of Point Grey Research on the occasion of the10 Years Anniversary of Point Grey

Vlad, what was your reason, 10 years ago, to make the risky move of becoming an entrepreneur ? Looking back with the experience you gained in the meantime, would you make the same decision again? What would be your recommendation for somebody from the industry planning the same step?

V. Tucakov: I was facing a choice between doing my PhD and starting a company. Both paths required dedicating of a lot of time and effort up front, with the potential for very little initial reward. I wanted to do something "useful", and my criterion for that was whether people would be willing to pay for what I could create. Looking back, it was the right choice, not just because the company is very successful – it seems like a lot of people are willing to pay good money for our cameras, but because I am proud of the role I played in taking an idea from conception to creating a real world product and careers for a lot of people as well.

For those considering the entrepreneurial route, I would recommend:

a) starting the company as early in their career as possible because while the learning curve is steep and you "skin your knees" quite often, it's also hugely rewarding and you get involved in every aspect of the business—I've learned about sales, marketing, finance, and other areas that your average engineer does not get exposed to that early in their career,
b) be prepared to make a significant personal sacrifice, and
c) enjoy the journey—it's incredibly exciting.

Originally Point Grey started with developing and manufacturing stereo sensors. Why did you decide to let it evolve into a camera company ?

V. Tucakov: In the early days, we bought board level analog cameras and put them together into trinocular stereo vision systems. Pretty quickly we realized that the price/performance ratio of the cameras we were using wasn't that good, and we felt we had the knowledge and skills to create something better, so we decided to make the whole units ourselves from "scratch". Pretty soon after that we started getting calls about these systems, but customers wanted the extra two lenses removed.

The number of camera manufacturers in the area of machine vision is rather high and seems to be constantly increasing. How does Point Grey differentiate themselves from other vendors, what are the reasons for the customer to purchase from Point Grey?

V. Tucakov: While there are many small players popping up, there are only a handful of companies that truly compete in this space—based on quality, selection and value for price. Point Grey scores high in all three areas. All our cameras are designed and manufactured by us in Vancouver—we know exactly where every part came from, who built the camera and who tested it. Our corporate slogan—Innovation in Imaging, is reflected in our introduction many new technologies, such as the first IEEE-1394b camera and the worlds smallest IEEE-1394b camera.

At the end of the day, however, the most important thing is customer satisfaction, and often this boils down to basic principles of professionalism, such as keeping your word and listening to your customers. This is really what keeps people coming back and telling their colleagues about us.

What is your expectation for the future of the camera market ? Do you foresee a consolidation of companies by M&As ? Or a consolidation of companies by cut-throat competition ? Or a further growing of the number of suppliers and concentration on niches ? Any other scenarios ?

V. Tucakov: The Vision market is very fragmented and there is space for many small and medium size companies. What the future has in store for larger companies is anyone's guess.

Point Grey seems to have a Henry Ford approach to interfaces: … as long as it is Fire Wire. What is your view on the future development of interfaces, especially with regard to Fire Wire and GigE ?

We believe in staying focused and playing on our strengths, and FireWire is obviously a big part of that. We talk to our customers, prospects and industry experts regularly and listen closely to what they have to say. We believe that every interface has its place, and success of the company goes beyond the choice of wire between the camera and the PC. Our growth and customer satisfaction levels tell us we're still on the right track. It is our opinion that major developments in the market will come from new and interesting image sensor technologies.

What are your plans with Point Grey for the next ten years of company life ?

V. Tucakov: Planning ten years out is very difficult as the market continues to evolve. Fortunately, we're a very nimble team that's able to react quickly to take advantage of shifts in the industry, and create a few shifts of our own. Our short and long term plan is simply to grow all areas of our business, particularly in Europe which is one of the most critical markets for Point Grey. We are a self funded company, which means that we do not have outside investors or the public markets to worry about, this gives us decision making flexibility many companies do not have.

What is your formula for success?

V. Tucakov: We focus on what makes sense for our customers, our employees, our partners and our suppliers. That's a very simple formula, but it is amazing how well it works

Vlad, thank you for this interesting discussion.

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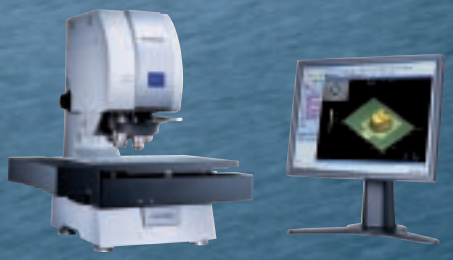

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